DOCUMENT RESUME

ED 290 480 IR 052 250

AUTHOR	Roberts, Kenneth H.
TITLE	The Library in Tomorrow's Society. A Literature Review.
INSTITUTION	United Nations Educational, Scientific and Cultural Organization, Paris (France). General Information Programme.
REPORT NO	PGI-87/WS/16
PUB DATE	Sep 87
NOTE	114p.; Best copy available.
AVAILABLE FROM	Division of the General Information Programme, UNESCO, 7 Place de Fontenog, 75700 Paris, France.
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Access to Information; Developed Nations; Developing Nations; *Futures (of Society); Global Approach; Information Systems; *Information Technology; International Organizations; Library Administration; *Library Automation; Literature Reviews; *National Libraries; Science and Society; *Technological Advancement; Telecommunications
IDENTIFIERS	*Information Society

ABSTRACT

Intended to reflect the international library community's expectations for the next 10 to 15 years and the place of the library in tomorrow's world, this extensive selective review focuses on the professional literature published between 1982 and 1986 which treats the probable evolution of different types of libraries in both developed and developing countries. The following topics are covered: (1) the future information society; (2) the future for librarians (the search for roles, the influence of technology, professional education and training); (3) the future for libraries (national, public, academic and research, school, and special libraries); (4) organization and administration of libraries (influence of technological innovations, information system design, policy and planning, interlibrary cooperation, networking, the management of change, the use of marketing methods, fees for service, and manpower issues); (5) library and information work (influence of technological innovations, developing countries, abstracting and indexing services, document delivery, social aspects of information work, information communication, technical processes and services, online information retrieval); and (6) related areas (computer and telecommunications technology, publishing, and storage media). The final chapter, which summarizes and comments on the findings of the literature review, notes that the review points to the increasing value placed on information by contemporary society and raises questions of how libraries will meet the demand for access and how the costs of access will be borne. A 247-item list of references concludes the document. (CGD)

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PGI-87/WS/16

The library in tomorrow's society

A literature review

General Information Programme and UNISIST

United Nations Educational,
Scientific and Cultural Organization

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Paris, September 1987

THE LIBRARY IN TOMORROW'S SOCIETY

A literature review

prepared by

Kenneth H. Roberts

General Information Programme and UNISIST

United Nations Educational,
Scientific and Cultural Organization

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Recommended catalogue entry :

Roberts, Kenneth H.

The library in tomorrow's society ; prepared by Kenneth H. Roberts
/for the/ General Information Programme and UNISIST. - Paris :
Unesco, 1987. - 103 p. ; 30 cm. - (PGI-87/WS/16)

I - The library in tomorrow's society

II - Unesco. General Information Programme and UNISIST

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PREFACE

For many years the General Information Programme of Unesco has produced guidelines and studies to help Member States develop national information systems, including libraries, information services and archives. The present document, which is part of this important programme, is intended to reflect the international library community's expectations for the next ten to fifteen years and the place of the library in tomorrow's world. This is achieved through a review of the literature of the last five years on the probable evolution of different types of library in developed as well as in developing countries.

This work has been prepared by Kenneth H. Roberts under contract with IFLA. The final chapter consolidates comments, suggestions and views expressed by IFLA's officers and specialists.

The designations employed and the presentation of the material throughout this document do not imply the expression of any opinion whatsoever on the part of Unesco.

Readers are invited to send comments, suggestions or requests for additional copies to the Division of the General Information Programme, Unesco, 7, Place de Fontenoy, 75700 PARIS, France.

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Introduction

The paper reviews selectively the professional literature published between 1982 and 1986 which treats the probable evolution of libraries and library services in all parts of the world during the next ten or fifteen years. Attention is paid both to the role to be filled by different kinds of libraries in the future and to the likely characteristics of these institutions and their services.

In this context the following comments seem necessary. The paper discusses writings (or portions of writings) which treat the future from the standpoint of the authors. Attention is given to the present situation only to the extent necessary to provide orientation. No attempt is made to produce a "state-of-the-art" survey. Readers will note, though, that in a world filled with as many contrasts as our own what authors may predict for the future in one country or region may curiously resemble the present or even the past in another setting. In some rapidly evolving technical areas such as electronic publishing and optical discs where predictions concerning the possible impact are continually being revised, emphasis has been placed on the most recent available texts.

It should be noted that although the author would have liked to give roughly equal weight to the future of all types of libraries and to all aspects of library services this could not be achieved. Speculative writing has, in fact, been largely concentrated in a limited number of areas. It may therefore seem to some that disproportionate attention is given to consideration of the impact that the new technologies are likely to have on libraries and their services. The future-oriented professional literature has, though, itself given a very heavy emphasis to these questions during the period covered. Furthermore, much of this literature is oriented to the influence new technologies are likely to have on academic and research libraries and on what are often termed "special libraries".

An effort has been made to reflect the views of librarians from all parts of the world. The prominent place occupied by British and North American authors in the bibliography of sources results from their notable productivity as authors on the topic of the paper.

Material was identified chiefly by consulting indexes and bibliographies of professional literature, in particular the issues of Library and Information Science Abstracts (LISA) for 1983-1986. Considerable use has also been made of unpublished papers presented at the fifty-second General Conference of the International Federation of Library Associations and Institutions held in Tokyo in August 1986. The theme of that conference was "New Horizons of Librarianship Towards the 21st Century". The organization of material in the review of professional literature, 1982-1986 was suggested by the classification scheme used for LISA.

There has been a rather abundant literature devoted to future prospects. The time frame chosen for completing the work did not permit the perusal of all the world's professional literature that discusses the future of librarianship, of libraries and of the services they are likely to offer. However a sufficient sampling was read to convince the author that in a realm where the ideas expressed proved in many cases to be repetitive, the perusal of the large volume of additional material identified through bibliographical sources (in the main by British and North American authors and on various aspects of the application of new technologies) would not have significantly altered the tenor of ideas reported in this literature survey.

Cronin in an article cited as item [31] in the bibliography comments that "understandably the welter of conflicting forecasts and predictions creates a degree of scepticism... The real point of futures studies is to encourage a forward-looking attitude - a willingness to consider what might be, as opposed to what is, or should be..." He suggests that broadly there are two approaches to forecasting, exploratory and normative. The former builds on past and present trends to arrive at a possible outline of the future; the latter begins with the specification of a goal or end-state, and proceeds to identify the stages to be gone through to attain that goal. For Cronin the two approaches can be complementary, but arguably in uncertain times like the present the latter has less to offer.

Most of the authors cited give no indication of the procedures they used to arrive at their predictions. A number though, employed the device of scenarios by which one or more possible visions of the future was forecast. A scenario is broadly a picture of a future (in an institution, community, country, etc.) based on aggregated forecasts in a narrative form. The particular objects of the study (i.e. manpower needs, administrative patterns) are then considered against these imaginary circumstances.

The Innovative Technology Group of the National Library of Australia [45] undertook to help plan for the future of the institution by identifying the social and technological factors which seemed likely to affect the functions of the library during the years 1982-2000, assessing their impact and then constructing a model of the impact of changes from sociological, technological and library management standpoints. The final stage was a consideration of the specific areas to which the National Library should give attention in order to produce short, medium and long term plans to guide its adaptation to changing circumstances.

Sorieul [116] used the DELPHI technique to survey by means of a questionnaire the opinions of 73 experts on future prospects for university libraries in Africa. Hayes [58] is among the authors who describe the use of strategic planning as a tool for effective medium and long-term management and development. Many other approaches were also used and the compiler was unable to draw conclusions about the emergence of dominant planning habits or trends.

The author found doing the reading for the literature review a stimulating experience and hopes that some indication of the richness and variety of the ideas he encountered will be communicated in the following pages.

During the planning of this work the decision was taken that the survey should record objectively what the recent professional literature indicates about future directions for librarianship and about library and information services and their use by the public. The author was not to record his personal views. A final section of the paper was to constitute the views of IFLA on these questions. The author sent the text of the survey to IFLA Headquarters which circulated it to a number of the Association's officers and specialists. The final pages of the text are based on the comments and suggestions which the author received.

A SELECTIVE REVIEW

OF PROFESSIONAL LITERATURE 1982 - 1986

"... in order to keep our perspective in the face of the advance of a technology rife with implications, it is salutary to remember that on the beach, on a summer afternoon with a cool breeze blowing in from the ocean, it is highly unlikely that anything will ever be found to beat the book."

Dr. Senri Miyaoku

SONY Corporation

From paper presented at

52nd IFLA Conference, Tokyo 1986

I

The Future Information Society

In the last several years there has been extensive comment in the literature of library and information science about what is widely regarded as the rapid evolution of contemporary society towards new forms. This is described succinctly by Mencu.[1] "The growth of the production of knowledge, the increasing division of labor, the growing complexity and geographic extension of organizations, and, above all, the expansion of a fast changing technology - in particular the information technology (computers, telecommunications, video etc.) - have involved all countries in a process of fundamental transformation, particularly marked during the last decade, which is often referred to as the 'information revolution'. Information in a broad sense, and with various definitions, is now considered as a vital resource, both for national development and in international relations. All societies, though at various paces, are moving towards a new state called 'information society'."

At the outset of an analysis of various futurist theories concerning society, Kochen[2] states,"'Information society' is a much overworked expression that has been used to denote many different concepts. The general sense in which it is most commonly understood refers to a growing, high-technology, materially affluent society in which information rather than raw materials or energy is the dominant technology...This characterizes one of two possible directions in which post-industrial societies... may be heading. Another form that post-industrialism may take is that of a society that reverses the trend toward complex, depersonalized systems. It strives, instead, toward a society characterized by increasing responsiveness to individual human needs, and toward preserving ecological balances."

These contrasting views are well shown in paired statements by Yoneji Masuda and Alexander King.[3] For the former the information society will revolve around the axis of informational rather than material values. The arriving information era brought about by evolving computer and telecommunications technologies will have such a heavy socio-economic impact on contemporary industrial society that the latter will transform itself into an information society. These technologies will influence traditional socio-economic systems in three phases:

-by taking over repetitive work through automation;

-by making easy certain intellectual tasks which could not be accomplished earlier and thus spurring new human mental activity;

-by modifying social and economic structures through the impact of the first two phases on the system.

Education will be accessible to all regardless of economics, time or place, for knowledge networks will free education from the traditional constraints of institutional infrastructures. Self-instruction is to become the motor force of education and teachers will act as counselors; continuing education will be necessary and available for all. For Masuda a historic transition is underway between the industrial society in which the natural environment was exploited and in which the consumption of goods and resources spread relentlessly and the society of information which will seek to coexist with nature thanks to the virtual transformation of humanity and the introduction of new socio-economic systems.

King, President of the Club of Rome, puts forward a more pessimistic viewpoint on the influence of technological changes. He predicts that the assault of the information society will have the following consequences:

- increased interdependence of individuals and nations through immediate availability of information;

- increased complexity of institutions and societies, already almost ungovernable;

- possibility either for a high degree of decentralization of industry and institutions as well as of power and decision-making or use of the same techniques to consolidate strong central power structures.

Technology contributes to the fragility and vulnerability of society since the functioning of cities and nations is dependent on equipment which can be destroyed by misfunction, attack or sabotage. When the microprocessor will have changed most equipment into black boxes and when the sophistication of the inventors of these tools will so far surpass the comprehension of the rest of the population there may exist an alarming distinction between the few who know and the mass who do not know. He suggests that to avoid the worst, it is first necessary to envisage it. For King innovative education and training are essential for preparing the information society. Unfortunately the present feebleness of most educational and training systems, even for retraining and continuing education purposes, risks making society vulnerable. The present educational curricula in most countries do not foster rapid change. Also too many teachers simply continue to teach what they were taught. Finally, will automation of a large proportion of human activities lead to the automation of humanity? King's answer is "perhaps", but if this question were foreseen and if alternatives were prepared, he feels the answer could be "no".

In an address of 1985 prepared to mark the 90th Anniversary of the International Federation for Documentation (FID) the same author remarked,[4] "The great transition into which we are entering will probably take some forty years to complete... The first indications of the Information or Post-Industrial Society are already evident and we see the decline of the heavy industries of the North." Nearly all the problem areas arise from the advances of science and technology and include the threat of a nuclear holocaust, the world population explosion, North-South disparities and the social consequences of the advanced technologies. "The advanced technologies and, particularly, microelectronics... have potential applications over the whole spectrum of economic and social activities... The introduction of steam, electrical and nuclear power replaced the puny mechanical power of men and animals. The new technologies will provide intelligence, memory and the processing of information to all devices originated by man, and at a modest cost.

In the information society, then, industry will be greatly changed, with widespread automation and the abolition of dirty, dangerous, boring and repetitive jobs... Patterns of employment and occupation will change, new skills will be demanded and profound modifications will be needed in the educational system. Adaptability and a capacity to change work and life styles will be demanded from everyone. The possibilities for the betterment of the human condition and for the universal abolition of poverty will be enormous... but the problems of the transition will be formidable.

All this will be taking place under conditions of a continuing increase in the world population, estimated to reach the six billion mark by the year 2000... By far the greatest increase will come in some of the less developed countries of the Third World, while, in many of the industrialised countries, growth is small and in some cases negative. These demographic differentials inevitably generate migratory pressures, which are already considerable and likely to increase in the decades to come."

The real problems of feeding six billion people at the turn of the century are not technical but economic, political and logistic. "In most of the countries with a violent population explosion, there is already considerable unemployment and it is estimated that it will be necessary to provide some one billion new jobs in the Third World before the year 2000.

These demographic movements greatly exacerbate the North-South issues, already in impasse... The advances in technology are likely as in the past, to favour those nations already advanced and thus increase the economic disparities... The uncertainties and complexities of the world situation are difficult to tackle with our present national and intergovernmental structures, which were created for earlier, simpler times, and there is need for much institutional and social innovation if we are to master the problematique."

Among the authors who have summarized interestingly the thinking of sociologists and economists on the sources, evolution and nature of the post-industrial and the information society are Magalhães[5] and Williams[6]. Both assign particular importance to the thinking of Daniel Bell, Professor of Sociology at Harvard University. "In 1973 he had written of 'the coming post-industrial society' as the consequence of three key developments - first, the rise to dominance of the services sector of activity; second, the growing role of theoretical knowledge for innovation in technology... and, third, the displacement of intuitive business judgements by systems analysis and decision theory which he described as the 'new intellectual technology'.

Seven years later he responded to the literature on 'the micro-electronic revolution' and wrote of the advent of the 'information society'... What Bell had in mind was the increase in the capacity to manage organised complexity made possible by the combination of information technology and new intellectual technology..."[6]

"Bell's theories... help to identify some important facts which are very relevant to the future of library and information work, namely: (a) that there is an information explosion and this information has to be organized; (b) that modern society is becoming increasingly complex and more and more dependent on information; (c) that theoretical knowledge plays an increasingly important role in social life and the signs are that intellectual production will not diminish in the near future."[5]

The Intergovernmental Bureau of Informatics (IBI) referred in an unsigned article to what is considered a certain inevitability in the progress of these pervasive social movements.[7] It is not correct to maintain that change in itself brings problems. Preventing change does not eliminate negative consequences. Governments should try to identify and control opportunities and risks rather than to stop an irresistible evolution. There is a need to formulate policy. Politicians should be aware of the dangerous aspects of technology. Speculation should give place to serious study on the interaction between economics, society and technological innovation.

Neelameghan drew attention some years ago to related questions.[8] "Power is participation in decision making and the control over the range of base values via sanctions and rewards. Thus, as a society moves from a pre-industrial to an industrial and on to a post-industrial stage, material property - for instance land, labour and capital - may no longer be the main source of economic power; the only unique resource input into the social - industrial process would then be human knowledge, the organized information which programmes and governs machine and human performance...

Many of the problems of modern society arise from its growing complexity, that is, multiple interactions and interdependence. The resolution of the problem is two-fold: to create political and administrative structures that are responsive to the new scales of social demands, and to develop a more comprehensive and coherent creed that diverse people can share. Limits to growth arise from limits to resources. But the expansion of knowledge or information is the type of growth that has no irreplaceable resources, squanders no energy. In the long run, the production, gathering and handling of information may be the only growth industry. And to make the enjoyment of that knowledge possible, technology must play its other great role: lifting the burden of mindless toil, and permitting what Norbert Weiner called 'the human use of human beings'."

For Kochen,[2] "An information society is one that: (1) enables most of its members to engage in productive pursuits that are knowledge-intensive, knowledge-generating, and knowledge-based; (2) has a communication network that freely circulates information about its basic societal invariants so that this information is consistently, effectively and efficiently acted upon in the making of choices; (3) manages inevitable conflict between conservative pressures to preserve these invariants and pressures for adaptive change by reason, knowledge-based understanding, and enlightened creative wisdom blended with human values, rather than traditional resort to base emotions and brute force alone."

A note of warning is given by Dosa.[9] "The literature reflecting Third World views indicates that most leaders believe the future of their economies depends on the rapid acquisition of knowledge. It seems that to share in the benefits of the international flow of knowledge, a country must have capabilities for (1) telematics, the activity based on the convergence of computer and telecommunication technologies, and (2) domestic R & D (research and development) and production to assure that the applications of telematics and knowledge thus acquired feed the national economy and development. Without the second condition, transferred technology cannot be absorbed and integrated with domestic inventiveness and creativity. Both conditions assume education, training and the development of indigenous manpower as a basic requirement...

Many authors write about the global 'revolution' brought about by telematics. But the revolution, if there ever was one, ended about the time when 'satellite' and 'microchip' became symbols of power to be attained in practically every society. We are already in the post-revolution period of the distribution of benefits, adaptation, and institutionalization. It is now that the meaning of information development and information literacy must be clarified... The gap that needs to be bridged is much deeper today than it was at the beginning of the technical assistance era. However the tools are... more effective than ever before. The question now is: Do we information professionals - in developing and industrialized countries - have the philosophical compass to guide the use of the technology before the technology begins to guide the development process?"

At the conclusion of a study on "information technology and the Third World", Slamecka[10] suggests that "the major effects of information technology in countries of the Third World are of social, cultural and political nature - improvement in social services, more effective information management and problem solving, and a host of political impacts resulting from the virtually borderless global realm of communications. The social and cultural effects should have a secondary, beneficial, economic impact. The primary economic impacts are likely to be beneficial in selected industries only, and unlikely to contribute to even a partial closing of the North-South disparities in production and trade...

The fundamental problem of the Third World - its poor standard of living of the masses - is caused by low productivity of [the] agricultural and industrial sectors, and by [the] inability to compete in international markets; hence it is an economic problem. Developmental strategies that fail to address this fundamental point, in the hope that developing countries may somehow circumvent it and blossom into postindustrial "knowledge" societies, are utopian...

The rate at which the potential of information technology is realized in the developing countries will depend not only on their policy makers, but also on the [adaptability] of their peoples, the methodology of applications, the attention and assistance offered by the informatic sectors and the governments of the industrialized countries, as well as on the extent to which the generic issues of development are approached from a global viewpoint.

Information technology is thus like other technologies: inert, neither a panacea nor an evil. It is also a catalyst of economic, political, social, and cultural processes that will inevitably affect the development of man's society. Man's use and management of the technology determines the kind, magnitude, and rate of this effect."

Finally, Escorcia[11] pointed out at IFLA's 48th General Conference in Montreal that "the underdeveloped nations of the world today are those which came late to their industrial revolution; the underdeveloped nations of the future will be those which came late to the information revolution."

The Future For Librarians - The Profession

The main thrusts of much of the abundant literature of recent years about future trends of the profession are identified in the previously cited article by Magalhães.[5] "In the literature one finds two types of approach to the question of the increasing penetration of the new technologies in the information profession: one that sees technology as an unstoppable driving-force and is concerned with 'saving' the profession, through a series of adaptations to the technology, but without questioning the purposes of the changes and innovations; and another that recognizes that there is a social purpose for the innovations and sees a need to plan and control the introduction of technology or which, in other words, advocates for the profession the role of leader of events, rather than that of follower. Within both these trends there is also a controversy about whether the use of computers and on-line information systems will upgrade the profession or whether it will make it obsolete."

In the first group one could include Surprenant[12] for whom the successful development of computers with artificial intelligence capabilities will negate the need for librarians as we know them and destroy the profession. At present librarians are the experts who must manage the systems, but as artificial intelligence computers grow and become more sophisticated, free language input and user interaction with the machine will greatly reduce the expert function and eventually eliminate it.

Thompson suggests in his article on "The End of Libraries"[13] that on the one hand libraries have reached an organizational and financial impass. On the other there have emerged pre-emptive new technologies for the storage, handling and transmission of information, potentially better suited to the convenience of users. Libraries may disappear like the dinosaurs or they may be able to adapt and successfully survive.

For Winkel[14] electronic publishing will affect the future of those libraries which succeed in meeting the demands of a changing society. The most important tasks for such libraries may include acting as advisers on information sources for industry and researchers; acting as a documentation centre for users without online facilities or search skills and providing user training. There will be new requirements for staff, improved cooperation for system development and perhaps a substantial transfer of library tasks from the public to the private sector.

In a similar vein Stirling[15] predicts that because of the spread of full text online data bases, the likely disappearance in print form of many reference works and the prospect of electronic document delivery over networked information systems libraries will move from a "holdings" strategy to an "access" strategy. There will however remain a storehouse role for libraries and information services, particularly in the field of arts and humanities. Libraries will in the future maintain only limited stores of locally-held information and will become increasingly reliant on information purchased when actually needed. They will become very largely switching stations. To the user the important thing is the transmission of information, the degree of access to it and not the method. With the proliferation of micro-computers and word processors, scientists and researchers will develop their own databases. Libraries may serve as intermediaries providing access to mainframe computers and to electronic mailing systems.

A somewhat more active role for the library of tomorrow is foreseen by Raitt[16] for whom the library will continue to act as an interface between a community and the universe of knowledge and information. While some fear that home information systems and services will lead people to bypass the library, only the technologically advanced members of the community, at least in the medium term, seem likely to use such systems and services. There is a view that home-based information services will have the effect of placing a focus on the librarian as an expert in the information field rather than on the institution of which he is a member. The library can become a communication centre, a unit in a vast network, maintaining complete databases on videodisc for local users; creating and publishing material of more limited or local interest and also providing access to remote sources of information. The librarian will be required to advise and train the user on information sources and to assist him in analyzing and synthesizing search results. The library will retain for materials in new formats its traditional storage, cataloguing and archival role. The librarian may also be called upon to advise users on problems relating to software, hardware, searching, communication and systems. The library will enter into competition with commercial system and service suppliers and introduce a beneficial competitiveness.

There is no scarcity of authors advocating the active leadership role for librarians which Magalhães identified as the second current of writing about future trends. In the introduction to his The Electronic Library Dowlin[17] asserts, "Librarians are approaching a decision point. They must decide whether they will create changes for libraries that parallel the changing needs for information in society, and thus thrive in the coming electronic age, or whether they will continue to serve their traditional role as custodians of books... An updating of our current philosophy and an awareness of our potential... can guide us in developing strategies that will not only allow libraries to survive, but to thrive..."

For D.J. Foskett[18] a society which has abandoned libraries has no stability because its existence depends not on the security of the shared points of view which add up to a cultural heritage, but on the continuous flow of unrelated bits of information. Is there need for alarm as the Information Age arrives at "the tendency towards standardization and the possibility that advanced communications technology might lead to the cultural dominance of one particular pattern over all others?

It is not enough for librarians merely to respond to new ways of recording and disseminating information. A more creative approach will come from a much greater involvement with both producers and users of information. What is required for this is an understanding of pattern, of the structure of relationships between Man and Nature and between Man and Man, nation and nation. This will not come from merely supplying masses of facts from the vastly increased output that characterises the present age...

On-line access to many bits of information will certainly improve the lives of many people. We have every incentive to encourage computer manufacturers to go on improving their machines and their software to fit the situations we meet in libraries... Among his 'Five Laws of Library Science' Ranganathan included as the fourth law, 'Save the time of the reader', and on-line retrieval of information from... databases does just that... Before many years are past library catalogues will all be converted into machine-readable form;..." On the management side nearly all operations offer scope for mechanization.

Up to the present innovative information services have developed mainly in special libraries serving science and industry. Many other libraries have made use of modern technology, but efforts to break out of the traditional roles have not so far become standard practice. Librarians should "bring the dynamism of information service into the areas of social science and humanities... This means enlarging... the role of the librarian... Introducing the techniques of automation has already begun to free librarians from routines like cataloguing... The sharing of records and access made possible by computers frees librarians from much routine that has become mere drudgery... At such an historic moment, when new technology offers librarians and information officers the chance to make a real contribution to enhancing the cultural heritage by active exploitation of all its records, it would be a tragic irony if the medium became the message, technology became the master and not the servant, and librarians found themselves once more cast in the role of keepers, not of books, but of machines...

As new technology continues to lighten the burden of routine handling of books as physical objects, librarians must turn their attention towards the communication of contents... This requires not the neglect of traditional skills but their enhancement; not the neglect of traditional media but their extension by means of the new. Libraries must not neglect their role as repositories... but become also mediators and promotors of communication..."

The Search for Roles

This identification of a pronounced social role for the librarian of the future is restated in a large number of articles of which the following may be considered representative. For Gélinas[19] librarians must become activists through awareness of their social, political and cultural commitments, initiating changes by asserting their power to regulate the flow of information and establish the frontiers of access to knowledge. White[20] asserts that library objectives should not be measured internally but by impact on the user. Compared with the information field libraries are at present failing to communicate. For Line[21] librarians should see their future in the broad information context and to do this must return to a consideration of what individuals will need for information and leisure in a future society. Van Nieuwkerk[22] encourages an accentuation in future services of a personalized, "human" approach to users. Sampath[23] suggests that librarians should become active agents who, with the aid of modern scientific and technological tools, should promote the dissemination and directed use of knowledge for the good of all. Finally for da Soledade Viera[24] Brazilian librarians should concentrate on offering users resources for developing their own abilities and provide information relevant to daily life as well as opportunities for communication with other individuals and groups. The librarian should become an agent of social transformation and the library an essential social institution.

The importance of using the opportunity offered by the penetration of new technologies for redefining what librarians do and how librarians should serve their users is cited in many writings. Fayen[25] urges that librarians who aspire to positions of authority should, like database managers, be prepared to take on the responsibility of providing real information, and vouching for its correctness. For Briscoe[26] et al. the strong challenge offered by the emerging information industry signals the importance for libraries to extend rather than to abandon their responsibility for permanently preserving mankind's records. Mapondera[27] suggests that for some African countries adoption of new media incorporating visual and audio elements will enable librarians to facilitate access to information for all levels of society. Hall[28] maintains that far from contributing to the deprofessionalization of librarianship, the introduction of automation will produce the technocratic professional for whom the provision of subject-oriented information services may reduce concern with the values of particular communities. In the view of Faule[29] using information technology requires the librarian to revise three fundamental notions: that knowledge is organized in conceptual hierarchies (online searching permits direct access); that information should be free (the benefits of a well-conducted search are worth paying for); and that the librarian is omniscient (automated information retrieval is best performed in teams working in collaboration with their public). For Lancaster[30] both team librarianship and information broking are examples of recent trends to de-institutionalize the professional librarian. Modern technology will accelerate this trend and change the traditional concept of the librarian into that of a skilled consultant evaluating and advising on the use of electronic information sources.

A number of authors forecast an important role for the profession in support of continuing education efforts. By the 1990s, Cronin writes of the situation in the United Kingdom,[31] "we can expect to see important changes in the structure of the tertiary education system... Open and distance-learning schemes will proliferate... A growing number of students will study independently and learn from home. New educational delivery mechanisms and support services will be developed to meet these needs... Librarians, public and academic, need to ponder the implications for their services... In some cases, public (and possibly even academic) libraries will take on a new role as community educational resource centres... The library's principal role would be the provision of access to electronic educational networks... The library would not merely showcase or store educational software and hardware, but provide tutelage, advice and information to the adult or independent learner..." Pogue[32] argues that as dynamic organisms rooted in and adaptive to society, libraries should now assume a commitment to continuing education, which is destined to play such an important role in future society.

The Influence of Technology

There are some who find various aspects of the probable influence of technological innovation a source of concern for the profession in the future. Seip[33] envisages conflicts between free access to information and privacy considerations and foresees difficulties with fees for services and copyright questions. Stoltzenburg[34] is anxious that a balance be maintained between the tradition of the "scholar librarian" and the new technology and that in general librarians learn to use the technology without becoming enslaved by it. Kaltwasser[35] in a paper presented at the 1986 IFLA Conference called attention to the dangers of suffocation from the overproduction of information and of the withholding of information through the manipulation of databases. Librarianship can survive as an academic discipline in the face of technological development, writes Wilkinson[36] only from a renewed emphasis on research concerning its role and boundaries; the profession must place itself in the forefront of intellectual development. For Gray[37] "Technology has been made to serve a cult of the 'future' such that the urgencies of the present are conveniently ignored... Those of us involved in the automation of libraries have been optimistically promising deliverance from drudgery, and are perpetuating the myth of technology as an autonomous thing, beyond politics and society, with a destiny of its own... The domination of the present by the future has combined in our minds to annihilate the technological present. The loss of the concrete... in the design and planning of automated systems thus has resulted also in the loss of the present as the realm for assessments, decisions and actions... It is always essential to construct a compelling vision of the future and to work toward it, and this is especially true with regard to technology. But it is equally essential to be able to act effectively in the present, to defend existing forces against assault and to try to extend their reach. In the absence of a strategy for the present, these forces will be destroyed and without them all talk about the future becomes merely academic... Librarians must understand and contribute to policy issues relating to information... We would be wise to think beyond our traditional roles to the broader contributions to the information community."

Professional Education and Training

While no special effort was made to identify writings on future education and training programmes for library and information personnel, an area which was considered outside the scope of this paper, a few items which made predictions in this area were found. Borko suggested[38] that library education programmes will change significantly in coming decades to meet society's need for information professionals working in libraries, in governmental and private information centres and as information consultants and entrepreneurs. For an article on education for new professional roles Dosa[39] identifies five of them likely to have a marked impact on future professional education patterns. These are information resource management, information counselling, research utilization, social networking and public information dissemination. Cronin,[40] writing of the situation in the United Kingdom stresses that "librarians and information workers... will require more and better quality post-experience training in information management and information technology." Library schools are generally "unable to provide continuing education programmes of the scale, sophistication and flexibility needed." Finally it is predicted by

Mc Keon[41] that in view of increased concern with preservation and restoration questions, extensive changes will occur before the end of the century in training and sources of conservation personnel for libraries and archives. In North America initially, most of this personnel will be trained administrators with library science or scientific backgrounds. There will be increasing emphasis on scientific knowledge rather than manual skills and special certificates or diplomas will become the norm in this field.

A Recapitulation

As a partial summary of views expressed in this section on the future of the profession it seems appropriate to quote passages from articles by Magalhães and Cronin. For the first,[5] "in the foreseeable future the need for libraries and information units will increase, not necessarily as we know them today, but perhaps more fragmented and integrated in the community they serve. Libraries are very likely to gain a central and vital role in a society which is so dependent on information, provided that the profession as a whole recognises the need to fight for what it believes are the true professional objectives. Regarding staffing, the emphasis will be put on more subject specialization and better management skills; there will be a move away from the conventional librarianship training, towards information management with a good background in information technology; there will be an inversion in the present ratio of clerical to specialized staff.

However such drastic changes will not come about automatically; on the contrary, there will be strong opposition from members of the profession who consider the established structures to be the best and will strive to maintain the status quo. It is entirely up to the present-day librarians to take action and veer the profession towards the future, otherwise we shall run the risk of being swept in the ebb of the micro-electronics revolution..."

Although the information sector of the economies of developed countries is considered to be one of the few where real growth in employment is likely to occur, Cronin[31] predicts that the traditional professions of librarianship, information, archives management etc. are not apt in most countries to be growth areas. Growth when that occurs will likely be for database designers, systems analysts, information resource managers and other careers outside traditional institutional settings. With reference in particular to the United Kingdom, but with considerable relevance to the situation in many other countries, Cronin feels "Some of the issues which seem likely to occupy the collective mind of the LIS [library and information science] profession in the years ahead include: the question of public sector/ private sector interaction (e.g. in relation to electronic publishing and document delivery); access versus 'tariffication' (should the user be expected to pay at the point of use for public library and information services?); copyright (relating to printed matter, videos, cassettes, software);... privatisation (of public libraries, whether in part or in toto; also of institutions of higher education); the role of the public library in providing subsistence level information; data protection; transborder data flow; and the search for improved output and performance measures in respect of LIS operations...

The LIS profession will become much more 'issue conscious' and much more politicised in its activities. One of the effects of recent technical change has been to force disparate groups to recognize one another's existence... Librarians, publishers, broadcasters, information consultants, computer scientists, archivists, telecommunication specialists, information managers and sundry other groups now meet... to discuss matters of multilateral interest and concern."

The Future For Libraries - The Institutions

Cannon[42] correctly points out that the interest of researchers or writers on information technologies over the last decade has focused on developments in hardware or software. Relatively little attention has been paid to the impact of these innovations on established organizations and the services provided by them to their publics. He indicates, though, that recent research in the developed countries suggests that the challenges go far beyond the technical and procedural difficulties posed in the past by innovations. A continued re-examination of the nature and role of the library is required which will "focus on the nature of the client service offered and the fit between current provision and the demands of an increasingly 'information aware' array of customer groups." It is notable that users of library services have a rapidly increasing awareness of both the potential of information and the scope for structuring and restructuring material to meet their needs.

"Change at this rate... cannot be tackled with traditional tools. It requires a re-examination of roles as well as tasks. Traditionally these have been based on the services offered or the facilities provided. Priority has been given to either widening the services offered or reaching more potential users... Faced with the current environment a new perspective is required. This emphasises the needs to be met rather than the means used to satisfy them. Emphasis will be placed on needs such as leisure or information rather than specific and potentially outdated means of meeting them."

The new information technologies pose challenges to present institutional structures on two levels: hierarchies versus networks and bureaucratic versus organic structures. "Most organizations, including libraries, are based on the hierarchical structure... The pattern of authority and flows of information tend to be upward/downward directed... Modern information technologies are built around a different model. Networks rather than hierarchies predominate... Exchanges are the key to effectiveness. This will directly challenge [traditional] operating procedures.

Simultaneously the scope for networking will raise doubts about the notion of organizational boundaries. The germs of this problem already exist among information providers, gateways and database managers. Incorporating this idea into the public sector areas of library services will raise more fundamental questions about divisions that exist, e.g. between the university and local library services."

Alloway[43] is concerned about "the place and the function of the library within its parent institution - be that corporation, academia or community. People have always sought information from a variety of sources, but technology has opened up new information channels with wider range and greater sophistication... These trends indicate that libraries may have to compete for financial support and status within the parent organization given the numerous information alternatives." A library will be supported only when the parent organization perceives that the library is supporting, enhancing, and contributing to the mission of that organization.

Attention is called by Slamecka[10] to the very different problems in devising the best institutional frameworks for information provision in developing countries where, in his view, "the typical literate person... does not tend to consider information as a problem-solving resource of any particular value or utility; he believes intuitively that the problem-solving knowledge he needs is what he knows. One has to go to the educational systems in the Third World - with their lack of training in problem-solving skills, emphasis on rote learning, large classes, and absence of libraries and reference materials - to infer that education unwillingly programs people to assume that the knowledge and experience needed to solve problems is stored in one's own memory, and that data and information external to one's memory are not an important problem-solving resource."

With particular reference to Southeast Asian countries, Vallejo[44] in a paper prepared for the 1986 IFLA Conference in Tokyo predicts that the kind of financial support required from governments to finance rapid growth of information institutions will be slow in coming because of insufficient awareness of their importance and value for society. Organizational structures therefore will not change rapidly. Among the predictions revealed through her interviews with Filipino specialists were that there will be in that country by the year 2000 movement towards a conglomeration of libraries, either in cooperative or coordinated structures; improved coordination of services through networking, consortia or other means of resource sharing; greater demand for information from a broadened clientele; and increased use of mechanization, particularly in academic and research libraries, because of the complexity and volume of available information, and the demands of the user population.

National Libraries

While the professional literature abounds in accounts of recent and current innovative activities of national libraries in many parts of the world, little future-oriented writing on this topic happened to be identified. A notable exception was a report of the Innovative Technology Group of the National Library of Australia entitled, Towards the Year 2000.[45] This discusses a study undertaken by the group to predict the impact of anticipated technological and social changes on the future role and functions of the National Library. As a first stage in producing the report the factors emerging from social currents, technological development and likely Government attitudes on financial and policy matters were analyzed. It was possible to construct a model of the impact of changes in information storage, retrieval and delivery systems from a sociological, technological and library management standpoint. Chapters on Australia and the Role of the National Library, An Assessment of the Impact of Information Technology and The Management of Change form the bulk of the text of the Report. Finally, consideration was given to the specific areas to which the National Library should give attention in order to produce short, medium and long term plans covering staff, finance, equipment and services in order to ensure that the Library could adapt to the changing circumstances.

Among the questions specific to national libraries which were identified as requiring planned solutions before the end of the century were the following: broadening of the concept of the national collection to encompass materials in new media (including electronic ones) and examination of the need for a shared national collecting network rather than a centralized store; resolution of archival problems of acquiring superseded data from electronic data banks, e.g. the equivalent of old telephone directories, long a principal name research resource; transition from a central to a shared cataloguing strategy; revision of scope of the library's legislative mandate to incorporate materials in new formats; creation by the Library of databases, bibliographies etc. to fill gaps in coverage of identified information needs provided from other sources; expansion of preservation activity as books and non-print materials deteriorate; resolution of regulatory and legislative issues including legal deposit, lending rights, copying laws, standards and the transfer of publications from one medium to another.

In his paper on the present and future activities of the National Library of China prepared for the 1986 IFLA Conference, Hu Sha[46] places emphasis on the extensive preservation and conservation programme which will occupy the library at least until the end of the century. It is hoped to supplement traditional manual repair methods and microfilming with new methods based on optical disc technology and the mass deacidification of wood-based paper.

Fassi Fihri[47] in another paper for the Tokyo Conference stresses the importance for national libraries in developing countries to undertake preservation programmes which might emphasize the use of reprographic techniques which are relatively inexpensive and allow subsequent use of the microform copies while sparing the originals. He also underlines the importance for national libraries to widen the scope of national collections to include, in addition to printed and manuscript materials, films, tapes and other newer formats with a view to broadening the nation's records of its past. Such libraries should no longer restrict their use to narrow communities of scholars but should open their doors widely to the young in order to acquaint them with the richness of their countries' heritage.

Public Libraries

The concern frequently expressed in the recent literature about appropriate roles for the public library in the light of changes in society during a time of widespread economic problems is summarized by Cronin.[31] "Public libraries differ from special, school and academic libraries in that they do not exist to serve the needs of a homogenous, clearly defined and captive clientele. Their potential user community is the population as a whole. Their task is made more difficult by the fact that they have, historically, attempted to be 'all things to all men'. Basically the public library operates in four basic markets - education, information, recreation and culture. The pressure to maintain existing levels of services for an increasingly demanding and discriminating public, while at the same time striving to introduce new services and facilities for special or minority groups (e.g. the housebound; the unemployed; the blind; the independent learner etc.) on existing budgetary levels, is creating unprecedented problems. The time is fast approaching when some form of radical reappraisal and prioritisation will be called for." In the numerous countries where public library provision is highly decentralized and largely financed at the local level, this needed appraisal of objectives often has to be undertaken, as in the United Kingdom, at local or grass roots level. Different authorities will perhaps choose different strategies or priorities. "Nevertheless it is true generally that increasing attention is being paid to needs of specialist groups within the community, and considerable effort is being invested in the development of more responsive and comprehensive information and advice services. In part this trend reflects a real need; it also... helps legitimise the profession's activities (in a way that the lending of light fiction and gramophone records perhaps does not)."

A pessimistic prediction about the future of public libraries in Denmark is given by Hansen[48] who speculates that during the 1980s and 1990s public libraries will receive scanty financing, library education will fail to take due account of information technology and unemployment among librarians will grow. Commercial information brokers will take over a large part of information provision. Use of the new information technology will penetrate universities, schools and homes. Society will become divided into those whose information needs are supplied at work, through research libraries or by home computers and the rest, forced to use public libraries ill-adapted to the new needs and stocked only with books and periodicals.

For Dowlin,[17] director of that public library service in the United States which has probably moved furthest in the direction of the electronic library, "the term 'public' mandates that a public library service be equally available to all citizens of the community and that the collections attempt to represent the widest possible number of viewpoints..." Just as libraries have provided publically subsidized access to knowledge in the past, so should they continue to provide this in the future. The process of adopting the library's budget determines the level of publicly funded access. "The public library should be the decision support system for all members of the community. This means providing the information needed for individual decisions and for community-wide decisions."

Another North American view is expressed by Martin[49] who predicts that the public library is left with a choice of two possible roles for the future: the new concept of the information centre or the older concept of the cultural - educational - recreational resource. He concludes that the public library has an opportunity for renewal, re-dedication and invigoration and that its future depends on its utilizing this capacity.

Reorientation is also called for by Ettrup[50] for whom the new public library service will take account of the new media. Change must be introduced within existing budgetary provisions. Not every unit of a library service should aim to provide a full range of services, for specialization and flexible opening hours will be necessary. The most effective library materials should be selected from a full range of formats, i.e. video should replace textbooks in the language teaching area. Provision of reference services will become the core of the library's activities.

Community information services

Van Cuilenburg[51] insists in an interview he accorded to Heijerman on the importance for public libraries of extending their social function to that of information centres. Librarians will increasingly become information brokers and specialists; their current over-concern with collecting and storing information will evolve into aiding in the definition of search strategies and similar preoccupations. Public libraries must, however, also retain their recreational function.

Because of librarians' traditional concentration on published materials, other institutions and organizations have felt obliged to provide community information. As a result, Dowlin[17] suggests, there is duplication of effort and major gaps in coverage occur in most communities. The local public library could provide leadership in organizing effective systems of local information and thus provide itself with increased leverage for funding. The ability of libraries to develop the necessary skills for this is crucial to the continued existence of public libraries in the United States. The major battles occuring in the information industry are over nationwide markets. This leaves a gap at local level that needs to be filled. The public library has the necessary institutional base and the tradition of service. For Dowlin the proper role for public libraries will be to provide the information system. Counselling and advocacy roles should be left to social service agencies.

Concern is expressed by Pollan[52] about an emerging class of Americans who risk being handicapped by the growing importance of information technologies they cannot afford. Public libraries will offer such people their best hope of entering the information age. These libraries are themselves under pressure as the collection, organization and dissemination of information is suddenly "big business". If public libraries can persevere in their commitment to give information away, they will be assured of a vital place in a society increasingly dependent on information.

In a similar spirit Cronin[31] states that "Successful social functioning is to no small extent dependent upon an individual's ability to gather, process and evaluate information of various kinds. Some individuals are better able and better positioned than others to make use of commercially available information systems and services. In the years ahead the public library will have an important role to play in ensuring that the needs of the 'information poor' or the 'information illiterate' are safeguarded, and that funds are made available to maintain public access channels and mechanisms for the less well-off sections of the community."

Belotti[53] suggests that to pursue their historic role in providing reference services, public libraries (in the Province of Venice) must use new technologies to provide online access to information stores and databases, not only of a bibliographic nature. Service must not be restricted to the resources of a single library.

Role in continuing education

For Kidd[54] the steadily increasing emphasis in society on lifelong learning, self-directed learning and distance learning can hardly be overlooked by public libraries. These, perhaps particularly in North America and the United Kingdom, have long had special affinities with adult education movements. With reference to the concept of the "information society" he points out that "information" does not equal "learning"; there is need for an important linking operation which enables learners to make their own sense out of information. Public libraries should become centres in which a community may cultivate the skill and power of its thinking. The library is the only institution with a mandate covering the lifespan of its clients. For Kidd there would appear to be three options for the public library of the future: pursuing the traditional role of collecting and maintaining a collection of resources including the software of learning; assuming a new role encompassing the traditional one but including the provision of learning processes for many kinds of learning, primarily self-directed or distance learning; or, because of insufficient resources to cover everything, specializing in service to a particular clientele or in the character of service offered.

Modifications of structures and planning

Among articles suggesting the possibility of modification of institutional structures are those by Summers[55] and Sleith and LaRue.[56] For the former, given the strain of demographic, budgetary and technical changes, there may be less expensive alternatives to maintaining the traditional central library in public library systems which will provide as high a level of information and services. For the second, widespread use of personal computers in offices and homes, linked with the databases, message files and diversified electronic stores of the electronic public library will inevitably effect overall service strategies and organizational patterns.

With reference to the underdeveloped countries Amaeshi[57] rejects the view that information for Africans must reach them via oral channels. For him the importance of knowledge and information for development in nations like Nigeria demands the evolution of planned, coordinated public library services with clearly unified, utilitarian, educational, economic and social objectives.

Finally, for Dowlin[17] a new set of fundamental and critical assumptions is required to determine planning for future public library services:

- the library should continue to provide published materials. Much of the community accepts and supports this function and it will continue to be a valuable contribution to the community;

- the library should become the formal information centre for the community. This requires the library to collect information, data and knowledge in unpublished form, and to publish it if there is a need. It also requires the library to become adept in the dissemination of unpublished information, in seeking information from the community, and in linking with other community information sources.

- service should be available to businesses and homes via communications technology to reduce the dependency on transportation for access;

- there may be a need to reassess sources of revenue. The issue of who pays for access to information will require debate and discussion.

Academic and Research Libraries

In a paper prepared for the 1986 IFLA General Conference, Hayes[58] describes a research programme being undertaken at the University of California, Los Angeles under funding from the Council on Library Resources which will: explore the effect of new information technologies on the ways information will be used in the research university; seek better understanding of the information resource requirements of major disciplines; and determine the role of information resources in the work of individual scholars, researchers, students and teachers. "The academic research university... depends upon the ready availability of information resources of all kinds... Those information resources take a variety of forms: the faculty, the library, the computing equipment, the media and related facilities, the laboratories, the museums, the archives ... Until recently, these information resources have been relatively stable, well defined and reasonably well organized within the university. The university has created libraries, computing centers and similar administrative units to manage them..." At present though, "fundamental changes are affecting the way in which information is created, produced, organized, made available, protected and preserved, and used. They are affecting the ways in which scholars work, the methods of publication, the means for distribution and access. They are affecting the organization of the university and of the libraries and computing facilities within them.

The British, through SCONUL [Standing Conference of National and University Libraries], are concerned with exactly the same kinds of developments..., and there are efforts in the European Economic Community... to deal with them. Even in the developing countries, universities face the same kinds of questions..."

Most of the writings identified about the future structure and use of academic and research libraries treat institutions located in the United States. Writing in 1983, Whitlatch[59] suggested that the trends in higher education towards larger percentages in enrolments of part-time students and those in subject fields associated with generally low library use might well lead to a future trend of declining library use. This would further erode administrative support for library budgets. Serious efforts on the part of librarians are required to identify and meet the information needs of non-traditional students.

Jenkins[60] is pessimistic about the capacity of large academic and research libraries to adjust to meeting changing information needs. The key would be to secure from university administrators the additional funds required to accomplish such transformations. For de Gennaro[61] and Battin[62] substantial efforts are required by librarians to effect the needed change from collection-centred to access- and service-oriented institutions possessing strong links with other components of national and international library networks. De Gennaro feels that funding must be identified to create online catalogues with internal and external networking capabilities;

the conversion of old card catalogues to machine-readable records; the strengthening of library collections and the improvement of access to resources in other institutions; and the provision of adequate space to meet the libraries' growth and changing needs. For Battin there is particular need for cooperative effort among academic institutions to counter competition from the for-profit sector over dissemination of information as a commodity. Veaner and Ackerman[63] explore implications of changes to be expected by 1995 and conclude that the mechanical and production concerns of academic librarians will substantially lessen, but that new skills, knowledge, attitudes and abilities will be needed in areas of intellect and human relations. Gapen,[64] after examining current rates of change predicts that university libraries will evolve rapidly and become increasingly non-hierarchical, entrepreneurial and horizontal. Librarians will more and more become involved in the process of scholarly communication.

Battin[65] suggests that if the new expanded information systems in university libraries are to be successful, it will be necessary to substantially revise existing information infrastructures. "The challenge for universities is not simply to explore the role of computers on campus - as so many institutions have interpreted the issue - but also to integrate information technology into the existing information system in a way that preserves the linkages to the existing knowledge base, encourages and stimulates the productive use of new technologies, and provides coordinated gateway access to the new universe of knowledge in a manner convenient and invisible to the end user." She is "not in agreement with the current trend to 'wire' the university from outside the scholarly process - to build the system from the imperative of the technological capacities rather than from the perspective and requirements of the scholar and the student... It is essential that scholars from all disciplines actively participate instead of letting it happen to them... The ways universities integrate and use the new technologies will have a... significant influence on the strength and vitality of higher education, and on society as well."

She describes the information scene and resources at the time of writing (1984) in the perspective of the Electronic Scholar of Columbia University sitting at his home or office microcomputer:

- a huge stock of books and journals, reasonably accessible - although in slow and inconvenient fashion. Only a small percentage of the bibliographic records were available in machine readable form;

- a well-designed and internationally standardized machine-readable format for control of bibliographic access;

- the national capacity to link existing bibliographic databases;

- a growing number of scholar-generated machine-readable data files with no orderly form of access;

- a growing number (more than 1600) of commercially available databases, again with no orderly form of access of which 38% required subscription fees in addition to computer and communication charges;

- incompatible hardware, software and communication networks developed out of the normal scholarly characteristics of autonomous entrepreneurship in the pursuit of knowledge;

- inefficient expenditure of individual and institutional funds because of lack of agreement on institutional compatibilities and standards, duplication of resources that could be shared, waste of faculty and student time in identifying resources and seeking access to them;

- serious questions involving copyright and the ownership of information, which threatened the traditional unobstructed access to information;

- increasing shift of cost of use of information sources to the individual, with the resulting division between information haves and have-nots within the academic community.

Battin continues, "The obvious answer to the Electronic Scholar's plight is the formation of a Scholarly Information Center by merging the Libraries and the Computer Center to provide an information infra-structure to stimulate the continuing autonomous use of information sources. The integration of Libraries and the Computer Center... will provide one-stop shopping for the University community as well as a stabilizing planning mechanism for effective and flexible response to rapidly changing technologies..." The Scholarly Information Center "does not imply a building and rigid hierarchy of chains of command. Rather it is the development of an organized structure with responsibility for the information function of the university which will evolve in response to the needs of the clientele and the imperative of the technology."

Planning and development efforts were well under way at Columbia. Traditionally universities subsidized the process of scholarly communication through books and journals by supporting library services and passed on to users the costs of access to computerized information. In the print era universities provided subsidized browsing by purchasing books and journals which were freely available. The costs of publication and dissemination of research were traditionally borne by the scholar and the publisher and not the university. New technologies are shattering this system. The expanded potential for expensive services necessitates establishing new policies for centrally subsidized services (paid from tuition, etc.) and a series of optional, fee-based services available on request.

Once the reorganization is completed, and if financial and copyright issues are resolved, the Electronic Scholar of the 1990s will find the following among the opportunities available at the work station:

- online gateway access to the universe of knowledge;

- bibliographic data for all printed works and machine readable databases and files;

- user friendly access by natural language, subject searching, keywords, titles, etc.;

- boolean logic, call-number searching, backward and forward browsing;

- information on on-order and circulation status of documents;

- downloading capacities and local interactive manipulation of files;

- full text access to data bases, data files and published works also preserved on optical discs;

- high resolution graphics;

- capacity to order off-line prints of machine-readable text, facsimile transmission of journal articles and/or delivery of printed publications;

- online access to education, training and consulting services run by the Scholarly Information Center.

The emerging new academic library will provide a basic set of services and technical capacities. Users will interact and experiment with the new technical dimensions and develop new requirements, which will then influence the evolution of a new shape for the infrastructure. The character and quality of the Scholarly Information Center will determine the character and quality of the institution.

School Libraries

Little literature treating the future of school and children's libraries was identified; the numerous current problems related to management and operation of such libraries seem to quite fully occupy authors. Dede[66] does look at the future of school libraries in relation to two powerful trends. New opportunities for delivering knowledge are developing as the new information technologies are adopted in society. Simultaneously the almost universal economic problems are forcing the adoption of non-traditional, less costly educational models. The transformation of both the role and the services of school libraries seems likely to be profound. Craver[67] considers technological, economic, educational, social and organizational trends that are having an impact on the school library media centre and may alter its future.

Fassi Fihri in his previously cited paper[47] stresses an important future role for school and children's libraries in developing countries. In many of these countries educational systems remain too inspired by those of the former colonial powers. A large proportion of the children in school have parents who are illiterate. There are no reading materials in the home and the child's only contact with written information may be with his textbooks. Up to 70% of these pupils may not continue beyond primary school and often rapidly forget what they learned. The ones who do go on to secondary and higher education frequently continue to suffer from the limitations of their socio-cultural backgrounds, remain as adults in subordinate posts and are unable to occupy successfully the positions of leadership in developing societies. Developing countries should place high importance on setting up large numbers of well-stocked school libraries to supplement the knowledge which children can absorb in the home environment and from the often ineffective teaching programmes. The presence of good libraries will in fact finally justify the very substantial investments made for education. The reading and consultation of well-chosen library materials supplemented by exercises in easy research methods will awaken curiosity, teach children to think and fight the stultifying "memorization" climate present in many schools.

Special Libraries

The anticipation of imminent and profound change is pervasive in the British and American writings identified on the future of special libraries. For Cronin[31] "The trend to distributed processing, decentralisation, direct end-user access to information, contracting-out of library activities, and the application of more stringent value engineering techniques to the operation of information units suggests that changes in this [special libraries] sector will be marked by the 1990s." Becker[68] predicts that as new technologies permeate the special library and the broader environment in which it operates, a new requirement will emerge to integrate staff, equipment and systems differently. For him, being a library manager in the special library of tomorrow will mean being part cost accountant, part planner, part information technologist, and part psychologist. Special librarians are destined to play increasing roles in establishing connections between information resources and people in the coming information society.

In the optic of forecasting the future of libraries and documentation centres in the social science field, Black[69] identifies related major trends in the North American information marketplace. These include a growing number of relevant databases, the multiplication of vendors and database retrieval services and improved access to non-North American databases. User needs and facilities are changing rapidly as "computer literacy" increases. The unresolved issues of the downloading of data and pricing are of special significance. Failure to take advantage of newly emerging opportunities will render traditionally-oriented libraries largely redundant. Making effective and innovative use of these innovations is the main challenge.

Organization And Administration Of Libraries - Aspects Of Future Patterns

Influence of Technological Innovations

It may be that no series of writings about the likely influence of technological innovations on the future of library services has attracted more attention than those of Lancaster on the theme of "the paperless society". His first views on the subject were recapitulated in several sources including a 1982 volume called Libraries and Librarians in an Age of Electronics[70] and in an article of 1985 called "The Paperless Society Revisited".[71] The latter evaluates the changes which had taken place in the ten years since he made his first predictions about the replacement of print on paper by electronic publishing and the arrival of a paperless communication system. He persists in the view that it is necessary to modify the concept of what constitutes a library (the library as an institution housing physical collections will eventually become obsolete) and continues to question the indispensable nature of the printed book. The present psychological barrier to the elimination of paper, however, remains a deterrent as "many people do not feel comfortable with records that exist only in electronic form"; but this situation may well change and a younger generation may be less insistent on the need for paper copy.

These views have not received universal approbation in the profession or in society. Foskett[18] asserts that the advocates of the paperless society interpret communication in the narrow sense of "information transfer", of moving "bits" from here to there in a society in which all knowledge is reduced to information stored in computer files with access by online consultation at a terminal. "Unless we are to revert to a state of a primitive society based only on man - machine interaction, the challenges to our minds will continue to come mainly from opportunities to consider and reflect at leisure on those ideas of others... preserved in libraries."

Resistance to the adoption of innovation has also taken other forms than the philosophical. Le Loarer[72] asserts that often the potential benefits of automation are not fully exploited; in cataloguing, for example, routine tasks are handed over to the computer but the possibilities of producing different types of catalogues for different categories of users are not exploited because it goes against established practice. The computer offers immense potential for improving services to users and reducing routine tasks, but its introduction requires a radical change of librarians' attitudes. For Olsgaaard[73] who analyses the difficulties experienced when computer technology is introduced in libraries, organizational and behavioral problems in the environment are common causes.

Kochen[74] puts forward the following views: "Information technology increases the supply of information, while decreasing the cost at which it is supplied. It increases the demand for the technology, shifting it from ways of supplying needed information by Gutenbergian media to electronic media. But it does not necessarily increase the demand for the total amount of information to be consumed. It does not lead to increased assimilation of information or its utilisation for improved decision-making and problem solving..." He concludes that information professionals and scientists are faced with the challenge of shaping this revolution.

Technological change as a factor in library organization and administration is, however, certainly here to stay. Avram[75] points out that "Changes in organization make people uncomfortable ; change necessitates retraining, technical change brings into the library a whole new breed of technicians that our managers must manage; old-timers are not happy, and 'new-timers' are impatient with the old. Technical people often relate more to the goals of their technology than to the goals of the organization. The marriage of the computer with telecommunications, augmented by microcomputers, video and optical disc, and advanced communications systems, is making profound changes on every aspect of a library, and in turn on all its staff."

While reminding that the application of new technologies has to date been very uneven both within individual countries and from one country to another, Galvin[76] also stresses that the profession has not yet exploited the full potential of these technologies. Information scientists continue to address specific problems including: the design of systems that permit users to interact with new technology through voice communication; research centering on behavioral and cognitive aspects of human information processing and information law and society. Boss[77] discusses the unfolding implications for libraries in areas like bibliographic utilities, electronic linkages, remote database searching and building local databases.

Laver[78] reminds us that the nature of library work in the year 2000 will depend primarily on the professional decisions that will have to be taken over the next fifteen years. For Rauch[79] the gap between traditional information systems and the new media must be bridged as a prerequisite for maintaining the role of the book in information work and as a guard against a widening of the division between informed and uninformed members of society. Sepstrup[80] suggests that librariesmust in the future be organized to ensure free and equal access for all to a varied selection of the opportunities offered by the electronic society and prevent the polarization of society into those with resources to take advantage of the new media and those without.

In terms of organizational patterns arising from the introduction of new technologies, George[81] charts the progress of library service through an era of collection development and organization and an era of mediation between user and collection to an era of the interdependence of different libraries with diminished local autonomy.

Masuda, in a paper prepared for the IFLA Conference in Tokyo[82] suggests that the technology of the Information Society will have a decisive impact on library organization. Over a period of time virtually all the work of acquisition, processing, the location of books and journals as well as circulation routines will be computerized. Electronic publications will spread and the content of many books and periodicals will be transferred to discs and printed out as required. The cost of maintenance of books and journals will rise, in part because of paper preservation problems. Remote access to a full range of library services by the microcomputer located in the home or office will become the norm. Library networking will spread and access to a Global Library Network equipped with an automatic translation system will be available to individual users through the home terminal. Library staff of the future will be primarily occupied with providing a sophisticated research and reference service.

New forms of information, Rogers[83] points out, tend to become incremental rather than displacing existing formats. It is therefore not sure that new storage media will completely displace conventional books. Microtext has supplemented rather than replaced book collections. Optical disc technology shows much promise but will not soon be available in many countries and societies. There is real danger, says Rogers, "that we will drown in information but be starved for knowledge. The [107] institutions in North America's Association of Research Libraries hold over 300,000,000 volumes; they add 9,000,000 volumes annually; and collectively they subscribe to 3,335,853 serials... Secondary publications will become more and more essential in managing information... Searches in commercial databases like Medline are already available... Technology is not so much the problem... as is our capacity to afford that which is technically feasible."

For Wilson[84] as we enter the "knowledge society" libraries are becoming value-added information and knowledge centres. "The present library world is confused by the apparent conflict of serving traditioaal scholastic and emerging business needs." Libraries have the lead in information. "The issue now is whether they can open it up for use and turn it into knowledge. If they can do this, they will become the gateways through which all must pass... The societal issue is going to be how we provide this knowledge to all citizens fairly... But market forces must create the future before we can have anything to divide up. To respond to these market forces, librarians will have to become business people. To qualify for funding, they will need to develop hard business plans, justifying investment, describing competition,rationalizing the role of the public versus the private sector... Accomplishing these institutional changes - surviving in the face of market forces that are now moving around the present institutions - will require unusual development of new qualities in the present managers."

In an interesting analysis of the steady penetration of electronics into publishing, Lancaster[85] traces the growing implications of this evolution for library organizations. There have been distinct phases in the transition to electronics. "The first is the application of the computer to the production of conventional publications. The second is the emergence of data bases and data banks for which no print-on-paper equivalents exist...; they are early electronic reference 'Books'. The third phase... will be the replacement of existing paper publications by electronic forms... There is some evidence of a migration to electronics on the part of libraries, at least in terms of their use of secondary publications. ... The most important effect of microcomputer technology, however, is that it is beginning to put into place the terminal infrastructure that can make a paperless publishing environment a practical reality."

The organization of public libraries seems likely to be strongly affected by information technology, perhaps most conspicuously at first in North America. With particular reference to public libraries Dowlin[86] writes: "The institutions that have been charged with providing access to printed information and knowledge must adapt to providing access to electronic media or they will be replaced as a primary source of information... The model for the library of the future is the electronic library. I define such a library as one that is committed to two basic principles: 1) the widest possible access to information, and 2) the use of electronic technology to increase and manage information resources... The functions of the electronic library should encompass: 1) providing access to complicated or seldom used data bases, 2) providing community conferencing and message center programs, 3) providing online access to information on library resources, 4) providing access to community data and community information locations for referrals, 5)providing access to resources in other libraries via netwoking, 6) providing access to high demand information materials via computer or videodisk, and 7) providing access to electronic resources for those who cannot afford home computers or terminals." The library of the future must provide leadership in information systems and be a strong advocate for information access.

Writing about the future of the libraries of corporations, Jewitt[87] states his view that the present trend in office automation towards information rather than process support will integrate the library as part of the information resource. In parallel, library automation will include functions and processes currently associated with office automation.

A number of authors have discussed the degree to which information technology will be adopted and will influence the organization of library services in the developing world in coming years. Moll[88] and Davies[89] examine the issues in some detail. Kawatra,[90] speaking of India, asserts that the new technologies will indeed change the information system. A responsibility for collecting and organizing local materials will remain an important task for libraries. These must also arrange to make machine-readable resources available and organize the training of user groups. By planning ahead libraries will benefit substantially from the societal changes to come. In a paper presented at the IFLA conference in Tokyo, Nonglak Minaikit[91] predicts that librarians in Thailand will in the future form a centralized system for work on major bibliographic projects, but act as a distributed network for other functions. Wide use will be made of microcomputers and adoption of standardized formats for machine-readable materials will be general. Online access to local as well as commercial databases will become widespread. Problems are expected with fee-for-service questions.

Boadi and Havard-Williams [92] try to promote the use of existing computer resources in West African countries for the production of union lists, catalogues, directories etc. and suggest further applications for coordinated acquisition and cataloguing programmes as well as the provision of current awareness services where national governments would support these endeavors. Adeyemi[93] and Igiwe[94] describe the particular obstacles faced in Nigeria and sketch future prospects.

For Griffiths[95] recent and future developments in microcomputer technology will facilitate its introduction in developing countries. Current trends of reduction in size and cost and increase in power, reliability and flexibility of the equipment are likely to continue. The mode of interaction with computers seems sure to become more flexible with the introduction of voice recognition, speech synthesis and touch sensitive machines. The most immediate obstacle to full exploitation of this technology in developing countries now is lack of trained personnel. Other factors are the inherent resistance to new technology from which all operating staff and potential end users are not exempt. Also in tropical climates disc drives overheat and their sensitivity to heat and dust may cause problems. Lack of a stable power supply may also be a factor.

Menou[96] predicts that in a not too distant future microcomputers will have the capacity of interpreting human speech and thus be able to record and process material from the oral tradition. They may also serve as a device for recording the community or corporate memories now stored in easily lost technical and administrative reports. Information from various sources will be easily consolidated and kept up to date. If one were to provide telecommunication facilities for data transmission, an interconnection among computers ranging from micros to mainframe could then contribute to reducing the isolation of establishments in small communities, effectively decentralize information resources, permit direct communication, interaction and information sharing and provide direct access to a range of national and international information resources. Menou sees the principal obstacles in the way of adopting this scenario as the "conservatism and automation allergy" of many archivists, librarians and documentalists in developing countries, widespread "computer illiteracy" in the environment, the handicap for many countries that computers "speak" English with the greatest facility and the proliferation of incompatible equipment, scarcity of appropriate software, lack of power sources, currency problems and scarcity of maintenance services.

Finally Molino and Guadarrama[97] suggest that the utilization of new techniques in developing countries is more a matter of adaptation to local conditions and requirements than a technical problem. Microcomputers can be an important tool for identifying practical solutions to such problems as the needed decentralization and increase of responsibility of constituent units in information systems; the organization of locally produced information and the optimal use of resources. This equipment can foster use of relevant, local information and decrease dependence on international information services. It can help develop local capabilities and stimulate the development of software adapted to local needs and local languages.

Information System Design, Policy and Planning

In a paper prepared for an international symposium on information retrieval in Beijing, Slamecka[98] draws attention to what he considers a significant change required in future systems design. In the past although information systems were supposedly designed for use by scientists, engineers or other users, they were actually built to be used by information professionals. Therefore designers of national information systems have traditionally been preoccupied with such tools as cataloguing, classification and subject headings, and familiarity with these has been a prerequisite for future use of the systems. "As digital information technology finds its way to the office desk and the laboratory bench, the problem solver (end-user) becomes the primary direct client of [national information systems]."

With respect to the situation in developing countries he points out that information technology is becoming increasingly useful and less expensive. It is clear that the latest proven technology is that which these countries should adopt in systems design since national information systems do not exist in a vacuum, but require close coupling with foreign systems including those in the industrialized countries. Some adaptation like that for software systems operable in local languages is obviously mandatory. Countries designing systems in 1985 were advised to view the role of information technology from the perspective of about ten years ahead because of a major impending change in which large stores of information in electronic form might well become available on inexpensive portable devices.

Ghonaimy and Shahein,[99] at a conference in Cairo on the approaching information society, while recognizing the importance for developing countries to mount rapidly in the context of a national information system the appropriate services needed to enhance industrial, agricultural and sociological development pointed out certain obstacles to information use in decision making. The real information needs of top managers remained ill defined and it was often difficult to extract from information intended for operations management what was important for decision making. A methodology of information-based decision making was not yet widely employed in many countries, and the importance of information acquisition and assimilation was not yet recognized by all decision makers.

For Hayes[100] at the same conference, "Data and the processing of them are the least important aspect of an information economy. They pale into insignificance in comparison to the readiness of people to understand the value of data, to know how to use them in their own decisions. Those are the real infrastructure of the information economy, not the information technologies, not the information institutions, not the information policies, not even the information professions. It is this also that makes the debate between centralized and distributed systems so significant. It is only as the decision making process is decentralized that people begin to use information and the infrastructure develops."

Among difficulties in the design and implementation of modern information systems in developing countries which Gupta[101] cites are that decision making patterns need to evolve and that those at the top must be convinced of the utility of the operation. There is reluctance in some bureaucracies to accept the notion of non-effectiveness in traditional decision processes. Even so, it may be tactically wise to introduce as a first element in computerized systems in these countries simple Decision Support Systems as a nucleus for further developments. He, too, stresses the importance for developing countries to adopt the latest and most advanced information technology since superseded old equipment may have high maintenance costs and software support and spare parts for it may become scarce soon after installation.

As to the desirable structure of national information systems, Slamecka[10] suggests that current developments in information technology argue strongly against national policies favoring centralized models. Lower equipment costs shift budgetary decisions regarding acquisition to lower organizational levels and there are advantages in having information access points and services dispersed throughout the problem solving communities. "The currently preferred model for the development of national information [systems] and services favors a mixtuee of 1) decentralized information services and 2) distributed operations for husbanding endogenous data and information." A national information policy should place emphasis on "participatory coordination of this nationwide complex, on methods of assuring minimal compatibility and standards, and on the development of markets."

In her analysis of trends in national and international information policy formulation, Bortnick[102] points out that in many parts of the world governments are establishing national policies to promote their information industries and to protect against the potential negative effects of the Information Age. Efforts to address information policies at the international level involve a process of reconciling these varying national perspectives. Privacy protection, questions of national and cultural sovereignty and economic development are examples of the effect that national concerns have on the formulation of international information policies. She finds that of these three aspects "the debate over cultural and national sovereignty is often more highly charged and less amenable to resolution than with other international information issues... As the stakes in the information economy increase, more countries can be expected to take actions that effect the flow of information internationally. As a result, the need to establish common 'rules of the road' to facilitate international information transfer will become more critical. To achieve such agreement will require a flexible approach which both promotes unrestricted data flows and accomodates national concerns and priorities."

A number of articles dealing with the planning of future library resources were identified. Kuznetsova[103] describes a conference at the Lenin Library which discussed the results of the first stage of a study on the library resources of the USSR and worked out procedures for a second stage and for forecasting the development of librarianship to the year 2005.

Malinconico[104] shows that planning exercises rather regularly assume linear progression and therefore fail to predict inevitable problems in introducing new technology. In complex undertakings some uncertainty is inevitable and should be anticipated. It is suggested that three estimates of the time needed to accomplish a given project should be made - optimistic, likely and pessimistic. A general description of strategic planning is given by Riggs[105] who then focuses on its applicability to libraries wishing to apply library technology. An overall approach as well as specific steps are given for focusing on the ends desired and then developing appropriate means.

Griffiths[106] describes a study to investigate the diffusion of innovations in library and information centres. The aim is to develop an understanding of the diffusion process, to determine factors that encourage or inhibit the adoption and utilization of innovations, and to make recommendations for alternative mechanisms for enhancing the diffusion process.

Inter-Library Cooperation - Networking

In her article on Naisbitt's Megatrends which seeks to characterize the approaching Information Society, Alloway[43] cites as one notable tendency the shift from pyramidal organization structures to networks within which people talk to each other, share ideas, information and resources. She points out that many libraries have long been networking in areas of shared services like interlibrary loan. The Information and Referral services offered by libraries seem particularly to fall in the pattern envisaged by some futurologists.

In introducing his description of trends for North American library network development, Jones[107] explains that in so far as their use of computing and telecommunications is concerned, these libraries have pursued the following route:

- First generation: Large, well-funded institutions attempted to apply computers to traditional library functions. Few of these efforts resulted in functional systems, but some did evolve into these.

- Second generation: Progress was made in producing and marketing "integrated library systems" and in development of an operating procedure called distributed processing. At the time he wrote these were relatively new and all the consequences were not yet known. [1984]

- Third generation: This seemed likely to be characterized by the "scholar's work station". There were already some library systems that processed requests from any computer on a university campus including the scholar's own microcomputer. As he wrote it seemed that normal library services would soon include direct access for the individual scholar to the local online catalogues, access to other campus databases and access to gateways that provide access to more remote databases.

The arrival of integrated library systems and the rapid development of systems to handle hundreds of work stations heralded significant organizational changes since libraries and computer services would deal with the same product, information and customers; the two will be obliged to develop workable operating strategies.

Database search services which began operations as closed networks with restricted membership were evolving into open, unstructured services available to any communicating terminal. Their long-range market objective is to serve the end user as directly as possible. Libraries, on the other hand, believe that end users may still require assistance in searching or may even prefer that the more complex searches be performed by professional librarians.

Bibliographic networks originally provided as services: shared cataloguing, production of catalogue cards and original cataloguing as required. In a second generation such services as the following were already being introduced: interlibrary loan management services (OCLC); centralized acquisitions services, a development slowed by the arrival of microcomputers; serial control systems; online public access catalogues (the first computer-based library activity to reach almost every library user).

Integrated Library Systems and Distributed Processing. A wide array is available for purchase by libraries. Their wide use is supported by falling costs of computer equipment and the increasing power of inexpensive computers to process data.

Future network services (third generation). Those networks that survive the distribution of systems and processing to the local level will already have planned their new operating environments. It may be predicted that artificial intelligence will be involved, and that the scholar's work station will be the most widespread point of delivery. In the general North American context there remain, Jones feels, for the future unsettled questions about the services to be delivered, the agencies which will be responsible for them and how (and by whom) services will be paid.

Dowlin,[17] recognizing that no single library can now have all the resources required by its community, stresses that each library will have to be a node in state, regional or national networks. For him, an intensified effort in linking networks is required. "Unless information access for society is costed out and decisions made establishing access to information for society, it will be left to the marketplace to determine the access by individuals. The marketplace may not provide access to those who cannot pay, or to those to whom the cost will be prohibitive because of distance or sparsity of population... Networking must be nurtured by a responsible entity."

In a rapid survey of information retrieval and library networks in Europe, Noerr,[108] speaking of the situation in 1984, described library networks there as primarily bibliographic in orientation, and frequently MARC-based. Retrieval was traditionally by author, title or some sort of bibliographic record number, but increasingly by subject or keyword searching. Access was through a mix of public telecommunication networks, private networks and a dedicated hard-wired facility. Librarians were the principal users, but there was an increasing trend to allow access to end users.

As for European information retrieval networks, these contained primarily bibliographic records, but textual and numeric data bases were rapidly increasing in number. Retrieval was based largely on boolean searching, although the approach used in the library network also appeared. Most of the users were intermediaries but the intent is to capture the end user market.

Noerr is of the opinion that library and information retrieval networks will combine, at least to some extent, even before policy decisions are made. Provision of value-added network services will stimulate true merging. Such "added-value" or intelligence may be database host/producer-oriented, commercial service-oriented or user-oriented.

Costers and Bossers[109] point out that as yet large bibliographic utilities spanning the European continent and serving large numbers of libraries (as do OCLC (Online Computer Library Center) and others in North America) do not exist. National or regional cooperatives operating centralized databases and open networks are in various stages of development. Another European trend is development of national union catalogues, especially for periodicals, together with interlibrary loan facilities.

Ďurovčík[110] suggests that the increasing demand in Czechoslovakia for complex information services can be met only through automation of library networks. Provision for an integrated library network has been included in the development plan for Slovak librarianship. District libraries will be equipped with terminals and act as information intermediaries for local libraries.

China's plans for developing its information retrieval system are described by Gao Chongquian.[111] The system, to be kept within economically feasible dimensions, will be based on real needs and will receive the strong backing of the Government. The principal problems faced in the short term are building up retrospective collections of documentary materials; coordinating the acquisition of commercial databases and creating local databases (standardization questions); development of a software providing powerful Chinese-character-processing capability compatible with Western languages and usable on different computers; setting up a public data exchange network (in cooperation with the Ministry of Post and Telecommunications), keeping in mind the use of satellite transmission to remote areas. It is expected that by the year 2000 the national computer-based information system will be on the level of those in developed countries. The use of microcomputers in conjunction with optical videodisks and optical fiber communication will bring a new revolution in information retrieval. By keeping alert to evolving technology China hopes to bypass traditional development patterns and catch up with the most advanced countries in this field.

A number of articles have been identified on future trends in networking and cooperation among libraries serving different sectors of the population, particularly in North America. The great significance of the recent development of library networks and low-cost electronic links for the many Americans living in rural communities is stressed by Chodos.[112]. Virtually all essential information can now be easily brought to a dispersed clientele. Planned inter-system cooperative networks are expected to result in large savings in book purchases. Provision needs to be made for rural communities to receive television and radio signals providing the educational and cultural programming that will become part of broadcasting. Doll[113] reports on research conducted in South Carolina, Illinois and New Jersey which indicates that there is sufficient difference between the holdings of school and public library collections to justify the future compilation of union lists and compatible databases as aids to resource sharing and library cooperation. As for university libraries, Stanbrock[114] argues that under present economic circumstances increased cooperation among universities is the only possible answer to financing problems. The resources not essential to each library will have to be pooled, the number of specialized branch libraries on most campuses reduced and the volume of machine-readable materials increased.

The activities of the Research Libraries Group(RLG), a partnership of 30 American research universities formed for the purpose of supporting common programmes of sharing and cooperation have attracted attention. McCoy [115] describes the development of the Research Libraries Information Network (RLIN) and highlights future plans. The telecommunication costs for accessing the huge databases of the consortium which contain more than 14,000,000 bibliographic citations were found oppressively burdensome, Rogers[83] reports. The Group members are designing a distributive processing system. While the central file will be maintained, it will be distributed, probably by optical disc, to member libraries many times each year. Local campuses will require large computing power for their libraries. A typical library expects to have 150 or more terminals which will serve as sophisticated work stations. Researchers with personal computers in homes and offices will likewise be able to consult the file. Other major programme areas of RLG, as reported by Battin[65] are resource sharing (interlibrary loan with assistance of electronic message systems; experimentation in progress with facsimile transmission technology); a collection development and management programme; and a preservation programme under which RLG is still filming deteriorating materials while awaiting full reports on results of the pilot projects of the Library of Congress on the use of optical disc for preservation purposes and its development of a mass deacidification facility.

Finally mention is made of a study by Sorieul[116] using the DELPHI technique to survey the opinions of numerous experts on future prospects for university libraries in Africa. All respondents agreed that the next steps were likely to be cooperation at national level and implementation of training programmes at regional level as preliminaries to the long term realization of fully developed information service by the 1990s. No general consensus was apparent on the sequence of subsequent changes. Instead results indicated two different sets of expectations: that the Western information market would develop integrated information services in Africa; and that African countries would achieve this independently.

The Management of Change

In his analysis of seventy replies received from chief librarians of public libraries in the United Kingdom to letters asking what they felt was likely to be the main problem facing them in the management of libraries in the next ten years, Mann[117] identified three problems in the following order of importance: management of resources in the face of difficult financial conditions; adapting libraries to the new technology; and adapting libraries to a changing pattern of leisure.

In the context of offering thoughts and theses for the future to an audience of special librarians in business and industry, Lewis[118] suggested that "if change is really what it is all about, then it is the management of change with which we must be concerned, and within that, necessarily, the management of conflict." Among sources of future conflict were to be the following: technological convergence is a strong trend and is strengthening; the functional limits and boundaries within organizations are dissolving and this change will accelerate; there is a growing need for 'total information management' at the corporate level.

Horton[119] after sketching the emergence in the early 1980s of the information industry and its new forms of personnel - the database distributors, the information brokers, information counsellors and many others,- suggests that the information manager must now coordinate and synchronize the functional roles of three broad information communities that operate in what might be called the company's information environment: the users - decision makers and problem-solvers at all levels; the vendors and suppliers; the intermediaries - the handlers or processors who "add value" to raw data products, unmodified hardware, or untailored software, through some kind of enhancement process.

The Innovative Technology Group of the National Library of Australia[45] judged that the capacity of the National Library to respond to changes in information technology and user needs sure to occur before the year 2000 would depend in large part on the capacity of the library to establish administrative machinery capable of developing the new services needed. Management decisions permitting wide ranging change were important. In their view technological changes will require libraries to become entrepreneurs as well as information service centres. "Libraries must recognize that they are part of the information industry. This industry is involved in creating, storing or disseminating information - either for profit or on a subsidized basis. The industry also includes commercial, governmental and not-for-profit organisations. The National Library is operating in two distinct domains of the information industry: 1) as a medium for the provision of information products to the community, either directly or through intermediaries such as other libraries; and 2) as the creator of information products such as databases or bibliographies.

"If the Library is to adapt to the future, it must accept that the management of change in a bureaucracy, within the framework of government, is a slow process. Success will depend upon anticipation of change and planning to accomodate such changes... It is clear that the methods of acquiring, storing, retrieving and disseminating information are changing quite rapidly. It is also clear that private enterprise will increasingly become involved in the provision of information services. This will have a substantial effect on the National Library. The Library must decide now which role it wishes to adopt in the future and to plan for it accordingly... If the National Library wishes to continue to be recognized as a leader in the field... it will have to adapt its staff, its services and its priorities to allow such recognition to continue."

In an article on information management Higgin[120] cites a report of the National Electronics Council of the United Kingdom. "Everyone involved with information technology, from its original designers to its eventual users, needs to recognize that human factors should be the prime concern of any design decision. Information technology should be designed around the characteristics and requirements of potential users, rather than being determined by what is technologically feasible, elegant or cheap." Higgin continues, "Traditionally our organisations have used a bureaucratic centralised model... However the development of microcomputer systems has changed that. Now, at least in theory, it is possible for the periphery to be as equally well-informed about the overall picture, as well as what is happening at other points on the periphery and the possible effects of interaction between such points... [This] challenges the traditional power structure of organisations. It will not be easy for this model to change. Individuals and groups seldom give away power voluntarily."

In speaking of "strategies for change", Atkinson[121] argues that the value of library successes comes from meeting the needs of patrons and that although in a period of great changes these patrons may change, they will continue to want fast, accurate and humane responses from the library. Librarians will always need intellectual acuity, commitment to quality and the ability to recognize human values. The way in which librarians adapt to imminent changes in library organization and management will be a measure of their success as librarians. In times of economic recession and new emphasis on human quality and high technology, smaller library units are to be expected. Finally he describes three strategies for change: to accept change; to change change; and to recognize that some things cannot be changed.

The Use of Marketing Methods

Forward looking librarians have traditionally worked hard to establish rapport with clients. Cannon[42] maintains that in view of the constantly growing range of possibilities in society for occupying leisure time and filling information needs this will not be enough. In marketing, four variables are seen as critical to the process of tailoring service to target groups: the product or service, its availability, awareness or attitudes and cost. With reference to the United Kingdom, the anticipated high availability of home and personal computers allied to the increasing penetration of television-based information services will reduce the cost of information search while raising questions about the viability of established cataloguing and reference procedures. Determining the appropriate response will not be easy for policy makers in the library services. It will call for more systematic and effective research and analysis of users and prospective users. The public library has done little systematic market research to examine the reasons behind non-use in specific groups. This cannot continue if the library service wishes to maintain its position in the market place as either a provider or distributor of information or specific library services.

Drawing on the ideas concerning the coming post-industrial society expressed in Toffler's The Third Wave (1980), George[122] insists that only by understanding how users are being affected by their environment can viable marketing mixes be established to meet user demands.

For Condous[123] libraries will face serious competition from the "profit" information industry which has seen the potential of an ever-increasing information service sector in society. Sophisticated information retrieval systems and management information systems are finding their way into research organizations and business corporations. Until recently the concept of marketing non-profit organizations has been considered inappropriate, it being felt that such organizations are not involved in an exchange process. In the traditional marketing model goods and services are exchanged for money. The concept is now extended to include the intangibles, so that an exchange takes place whenever something of value - whether money, goods, information or attention - is offered for something else in order to fill a need. With this extension of the exchange concept, marketing as a tool is being applied in the non-profit sector (hospitals, social agencies, museums etc.) with a degree of success.

Marketing requires analysis and planning and the view that it is synonymous with promotion is misleading. The components of a good marketing strategy include not only a promotional campaign, but also product analysis, the development of outlets for the products and an effective pricing strategy. As to the "product" Condous maintains that libraries have established as the core product "information" and provide it in all kinds of packaging. However librarians have been remiss in establishing exactly what their patrons are really using. The student may use a textbook for knowledge; an old man reading a newspaper and talking to the librarian may be using the library as a refuge. The products - the book, the library - are the packaging of problem-solving services which is what the library really offers. Marketing can provide librarians with a methodology that will help provide products and services suited to the market segments the library hopes to serve. Libraries need to change from product-orientated to consumer-orientated institutions. Instead of concentrating on the raw materials, they should become increasingly involved with client satisfaction. With its methodical approach marketing will help libraries achieve a new position in the information industry.

Wood[124] points out that such diverse functions as fund raising, collection development and bibliographic instruction can be done more effectively if marketing principles are applied. For Dragon[125] libraries are in competition with other organizations for utilization. The library that attempts to influence the behavior of the public is involved in marketing, and its use provides an important tool for identifying the needs of certain sectors of the public.

Slamecka[10] draws attention to the fact that in developing countries there is a need to devise effective ways to inform top and middle level executives regarding successful application of information technology in information services. "Marketing information technology and its applications is different from the traditional approaches to imparting 'information awareness'... in that it must demonstrate the empirical utility of this technique in project planning, inventory control, personnel and customer records, management and similar activities. Such marketing efforts must be well planned with all the elements in place". The reward is in an increase "in the managerial perception and practice of information management, and in the improvement of social and commercial services that depend on better information management."

Fees for Service

A question which seems certain to occupy library administrators in an increasing number of countries far into the future is that of fees for service. In her article on "megatrends" in the evolving society, Alloway[43] draws attention to the economic forces at play in information dynamics. Information is increasingly viewed as a commodity to be bought, sold or traded. Although library materials to provide basic facts and recreation are likely to remain accessible to the general public, financial, technical and scientific data is increasingly distributed in digital formats. This requires the appropriate hardware, software and funds for retrieval, usually beyond the reach of the average citizen. For Alloway, "this segregation of information has certain potential for abuse and threatens to stifle entrepreneurship, creativity and ambition if information becomes lodged in the realm of the rich." It is suggested "that librarians demand print versions of online data, form a nonprofit database vending consortium, and reform such discriminatory practices as user fees... Library organizations must strengthen their roles as watchdogs and mediators of the economic and political trends within the information industry."

Rogers[83] points out graphically that "information is not free. The 107 members of North America's Association of Research Libraries collectively spend over US $1,000,000,000 annually. The Library of Congress alone has a budget of $240,000,000, and my own library [Yale University] spends $20,000,000 a year... ($2,000 per capita of the student body and faculty). The cost of adding a single monograph to a research library exceeds $65 when we consider both the cost of the material plus processing... No, information is not free; it is a semi-precious commodity."

The views of individual authors writing on the theme vary widely. For Pattison[126] the predictable need for increased services in the "information era" as a growing proportion of the work force comes to be employed in the information industry suggests that library services should be paid for through taxation while requests for specific information and access to specialized databases should be fee-based. Sullivan[127] points out that introduction of fees may very well shift the burden of paying for libraries from the taxpayer to the user. But this will deprive members of lower income brackets such as students, senior citizens and the handicapped of library use. Buhman[128] signals the emergence of information brokers to serve the needs of commercial users willing to pay for their services. While the principle of equality of access is important and the charging of fees can certainly seem discriminatory, even now few libraries can afford to provide services like interlibrary loan and online search costs free of charge. In the future each library must determine its capabilities to meet needs based on its financial resources, staff capabilities and the profile of individual users. A complete equality of service will not be realistic. For similar reasons Skrzeszewski[129] believes that the traditional defense of the concept of free public libraries can no longer bear careful scrutiny.

Wilson[84] maintains that the major institutional changes which libraries as organizations are to undergo as part of societal changes will necessitate a general revision of traditional views on the fee question. Fee-based programmes making extensive use of electronic information have already begun in some university and public libraries. In his view libraries will have to operate for all users, as does business, on a strict charge for services rendered basis. In university libraries, for example, faculty and students will be charged on the same basis as external clients of the library from business or the professions. However members of the university community will pay their fees from budgets allocated to them by the university. The university will finance the expense from tuition payments and its other funding sources.

Dowlin[17] with reference to a particular American public library system believes that the public library should not charge for the functions contained in its basic mission. However the electronic library may charge for added convenience or for services not included in the mission statement. Thus information services and reading materials should be provided to the public with no charge, but a fee could be collected for an electronic mail service. The individual choosing to come to the library will have free access. The fee for the alternative electronic mail communication to the user's home does not deny access, it provides convenience.

In a paper prepared for the Public Libraries Section at the IFLA General Conference in Tokyo Beard[130] presents the report of a Working Group on charging for public library services. The report, based on information obtained from Brazil, the German Democratic Republic, Netherlands, Norway and the United Kingdom, describes the positions found and discusses the arguments used for and against direct charges. The introduction of information technology has complicated the issues, and the concept of value added services with public and private sector involvement is introduced. "What we are seeing, Beard concludes, is an evolving pattern of public library use which is adapting constantly to technological advances in the communication of information. It is not easy to lay down policies, generally applicable, which will stand the test of time... Although no formal recommendations were made by the Group it was generally agreed that any barrier to access to books and other materials, such as the introduction of charges, would lead, almost certainly, to a decline in library use. Apparent financial gains which might accrue would be marginal compared with the total cost of library provision and would, it is suggested, be more than offset by the detrimental effect of such a move on the educational and social benefits."

Manpower Issues

Cannon[42] reports on the wide body of research concerning the impact of the new technologies on workplace practice. There is an emerging consensus that it has effects on both an individual and a managerial level. In the short term the greatest difficulties for individuals are posed to older, less well-educated staff who encounter problems in responding appropriately. Among those adopting the technologies and developing appropriate expertise there has been enhanced responsibility and job enrichment. Management has an obligation to give serious attention to the education and training needs of staff in the new skills. In addition strategic planning exercises on the evolution of services to be offered in a community or a sector are central to both the process of adoption by users and achieving the appropriate internal responses. The frequent reluctance by decision makers in library services to embark on strategic planning reflects both a lack of training in this field and a tradition of dependence on external policy formulation. Opposition to change can often be seen in senior staff unwilling to communicate effectively with juniors about key policies in this field.

In their scenario for the 1990s on structural change in the information profession, Gleave _et al_.[131] point out that the growth of "user-friendly" applications software may reduce the existing bias to use those with a technical background for new jobs in the information field. Attitudes of staff members to new opportunities may from now on be more important than the technical content of their previous education. A work force with systems knowledge and management skills is very much in demand. The role of that workforce is becoming much more advisory in nature as the "end-users" of the information begin to act more closely with the technology itself. "By 1990, and certainly by 1995, it is probable that workers in most of the information occupations will be required to utilize a computer terminal... It will be additional skills and knowledge of information systems which will determine which individuals and occupations are most successful in colonizing newly created jobs in the expanding information complex... Perhaps the two largest threats to growing employment opportunities for computer skilled information scientists are: 1) the possibilities of continuing penetration of the profession by computer-skilled staff;

2) the impact of communication developments on the location of work. As it becomes increasingly possible to access data from more and more locations, many users of computer-based information systems may elect to perform information search and coordination tasks themselves."

Attention is drawn by Bearman[132] to changes in the information environment which are determining new roles for the information professional. She regards this as an evolutionary process which began two decades ago and will continue. Among the more significant of these changes are the blurring of the different elements in the traditional information transfer chain and a pronounced shift to customized information services. Database producers are starting to retail their databases instead of wholesaling them to vendors; software packages are sometimes prepared for the ultimate user rather than the intermediaries and publishers perform any number of tasks not traditionally associated with publishing. Products and services are designed and repackaged for individuals, either at home or in business and industry. There are numerous challenges for information professionals to identify users' needs, develop new products and market and sell them.

For Norton,[133] tomorrow's information professionals will be less passive and more committed than their traditional counterparts. They will be required to exercise a high degree of professional judgement in roles of increasing demand. There is a need to respond flexibly to developing possibilities in a rapidly changing information industry. Drawing heavily on the predictions of Lancaster, Nitecki[134] reports that "considerable trauma" is expected to occur within the profession during the transition to the electronic library. In institutional settings, a dwindling away of technical services is forecast and the remaining library activities will be highly service-oriented. In the academic library librarians will become information consultants linking users with subject data. Public librarians will facilitate terminal access for users and help conduct difficult searches. School librarians will provide access to computer-assisted instruction facilities and recreational materials. As for the particular competencies required of future public service librarians, Nitecki stresses: knowledge of the communication process, of publication and dissemination processes, of interpersonal communication, of design and management of information services, of evaluation methods and of how to retrieve data and exploit resources. Thorough familiarity with communication activities including electronic mail systems and computer conferencing will be necessary as will be, above all, flexibility and common sense.

Writing about the public librarian of the last years of the twentieth century, Sweeney[135] objects to the popular notion of librarians as people in charge of libraries. This concept is challenged by the trends of the new technology and the philosophical basis for librarianship. "Librarians should not be defined by a place - i.e., a library or even by a type of media such as the book. They should not be defined by print, audiovisual materials or computers either. Librarians must be defined by their service-activity for people." They seem certain to be less bound by walls than in the past and will less and less be considered as caretakers of buildings and collections as is now the case in many cultures.

Sweeney suggests new competency areas required by future public librarians: managing information technology; keeping abreast of current and anticipated developments in information technology; analysis and diagnostics of information-seeking behavior; grasping the societal issues that develop from the information technology (copyright, privacy, database security, private versus public sector information roles etc.); building knowledge bases (dealing with information overload by providing a filtering and synthesis process).

For Dowlin,[17] the role of the librarian in the electronic library is to provide "value added" to the data, information or knowledge by collecting, storing and retrieving it within a framework that guarantees and enhances access and retention, and tailors the collection to the community that the library serves. The librarian is a gatekeeper who controls the flow of communication and a guide.

Library and Information Work - Aspects Of Future Patterns

Influence of Technological Innovations

Information technology is widely seen as likely to have a profound influence in determining on the one hand users' needs and on the other the shape and nature of services offered by libraries. Perceptions about the desirability and exact character of future changes vary widely.

For Hildreth[136] society has moved in a short time from the age of Henry Ford to the Age of Aquarius to the Atari (or Apple) Age. With the emergence and spread of electronic information, despite potential problems, humans will be freed of much of the drudgery of repetitive manual processes. While libraries will not have a monopoly on providing and accessing information, there are likely to be more library users than at present, who will be better served than in the past even though few of them will go to the library as a place or building.

Piantoni[137] suggests that improved technologies are necessary to meet present information and communication needs of Italian library users. Fundamental problems awaiting solutions include: reducing the time for satisfying user's requests; improving possibilities for exchange of information between different organizations; reducing the distance between the source of the request and the place where the information is held and simplifying the means of transmitting documents. Automation will ensure improved communication between the users and the system.

In the view of Knopp[138] libraries have been transformed by technological advances, particularly those in the fields of copying, microtechniques and electronic data processing and publishing. The point of departure in re-thinking the position of the library and its services should be the requirements of the user. The price to be paid to keep up with technological advances while at the same time preserving traditional services as well as meeting changing user demands may seem high. But it must be paid if the library is to remain the mediator between the user and information.

For Gélinas[139] the introduction of new technology in Quebec's libraries already permits offering improved services to users and is stimulating participation in local, regional and national cooperative networks to maximize the use of resources. Problems connected with levying charges for services, user training and copyright regulations have been raised. Technology will surely increasingly affect services, resources and financing to the end of the century.

As we have seen the future environment for libraries has been frequently described. Another view is presented by Anderla[140] who, following a retrospective overview of the predictions concerning information needs and resources contained in his landmark publication "Information 1985" published in 1973, outlines guidelines for strategic planning of services to the year 2000. The focus is on the anticipated shift from a technology-dominated market to a market-driven technology. Other analyses of Anderla's fifteen year old study and forecasts are found in Kemmling et al[141] and Simpson.[142] Among the "megatrends" which Simpson identifies here and in another article[143] as likely to characterize the information scene are the following: information is becoming a strategic weapon; ownership of information is at the root of a growing conflict between the public sector and private enterprise; information is no longer free; all "high-value" information will be available in digital form; and a worldwide "megalibrary" is emerging.

There has not been unquestioning acceptance of the suitability of available technology for the tasks to be accomplished. Möhr et al.[144] examine the extent to which the dissemination of information can really be improved with available technology, turn a critical eye on the prospect of publishers as producers of information competing with information brokers and try to calculate eventual costs to the user. With reference to the management of collections and their content Magnuson[145] points out that computerized management information systems can supply a wide range of data on acquisitions and circulation which can aid selection policy and weeding as well as shared cataloguing, interlibrary loans and cooperative acquisitions but advises careful examination of both the human and budgetary implications of every innovation in areas like videodisc and electronic publishing before investing in these products. For Gillman[146] much of the development in computing has been aimed principally at the hardware, and not the software. "So perhaps as computers become commonplace and some of the excitement goes out of them, we will see more users prepared to stand back from their hand-crafted databases and seriously question not only the appropriateness of constructing them, but also the quality of the stored information."

The same author[147] in the context of a discussion of the problems of changing established methods of working complains that all too often new technologies are adopted to carry out only those "tasks whose nature is hallowed by time and tradition". He suggests that microforms provide conveniently compact storage technology but that their use is hampered by continuing to retrieve frames using the concepts applied to manual filing systems. Practical retrieval from the full text of microform documents, other than through secondary systems, is still a long way off.

For Gillman much of the thinking about, and application of library automation to maintenance of databases of records seems simply an electronic version of the manual card catalogue, with all its inherent defects. Speed of access has been addressed, but such systems still rely on a small number of keywords, mostly allocated from the decomposition of a class mark, as searching terms. The automation effort has been devoted to the apparent problem - the vast cost of maintaining large manual catalogues - without really capitalizing on the power of computer retrieval. A further characteristic of bibliographic systems is that the functions of document recording and reference retrieval are tackled as distinct and quite separate from those of document retrieval and delivery. Reference retrieval may take minutes while document delivery may stretch from hours to days or even weeks.

Gillman suggests that electronic technologies offer an unparalleled opportunity to look at structure and organization of information services in a wholly new fashion. While the equipment is getting cheaper and cheaper, the level of understanding of how it can be best used is not at such an advanced state.

Speaking of the relationship between research as conducted in universities in the United States and the new information technology, Battin[65] points out that the structure of research activity "is based upon knowledge access structures conceived and built over the years by the library profession... The personal computer - no matter how ingeniously networked around the campus - will remain an interesting toy unless it provides to the owner true gateway access to the entire range of information required for... particular scholarly concerns." While traditional bibliographic control systems contributed to the research process, "scholarly applications of technology to date have tended to emphasize the capacities of the technology for a discrete avenue of research or the processing of unique data rather than the broader requirements of the scholarly community at large. Frequently the products of such applications have been compilations of data inaccessible to all but the creators, incompatible systems and lack of universal standards. Increasingly the task will be to deal with the relationship between the data and the recipient."

In spite of difficulties, adoption of new information technology is advancing rapidly in these institutions. In a description of North American online information systems Sharrow[148] maintains that an increasing number of end users want to access commercial databases for themselves. These searchers have usually been trained by library staff. Users, however, do continue to have problems with search formulation. Costs of interlibrary loans, the legal implications of stricter copyright regulations and problems related to telefacsimile are among the concerns requiring debate and the development of workable strategies by librarians.

Sharrow predicts that by the year 2000 "researchers will successfully undertake their own database searches using their own personal computers. They will find the protocols easier to understand than at present and the costs gradually diminishing. By that time the end-user will be able to search and download information from various public, commercial and semi-private files... Transmission of the full text will become increasingly... available," and there will be general improvement in document delivery speed. Costs for interlibrary loan will probably not decrease. Copyright may be more strictly enforced, but will be handled in a different manner. "Networks and linked systems will allow computers, and by extension, the end-user to talk to one another with ease. Librarians need to plan how they will train end-users and interact with various online information systems. They will be able to impact upon the future of online systems, provide input into simplifying the searching process, and solve the political problems inherent in sharing databases."

Matheson[149] discusses the deinstitutionalization of libraries and what can be done to shape the future role of academic research libraries. The critical issue is control of the management and distribution of information within institutional networks. She maintains that there are opportunities for creative entrepreneurship for librarians in the information delivery business. For Bucknall[150] the information available electronically will increase very greatly in volume, but it will not overthrow or supplant printed information. On the contrary both forms will "persist in amity, each adapting to the purposes for which it is uniquely suited" in a relationship paralleling that of painting and photography. Despite the wonders of the electronic world resource sharing will still ideally take place among universities in geographical proximity, so that document delivery time or user travel time is minimized.

Molholt[151] envisages librarians and managers designing the integrated information support systems of the future. This framework for services will incorporate the best elements of computer centres (24-hour access; cost-effective storage; direct access to local and remote data; technical expertise) and libraries (user-friendly orientation; structured files and collections; free access; subject expertise). Cooperative development will be required in indexing, conversion of print to machine readable form and other areas.

For Wiggins[152] the new information technology will exert a strong influence in reshaping information services in business and industry. The factors which contribute to the current move towards distibuted information (which will accelerate) include: user dissatisfaction with traditional data processing units; the rapid development among potential users of direct knowledge and experience of computing and the possibilities it offers; continuing drop in hardware costs as computing power increases; improved availability of user-friendly software, including that designed for networking; increased opportunity for end-users to have complete control over their applications; and improved telecommunications facilities. Although this environment provides exciting possibilities for the end-user, it also creates problems of information management and control. While the various traditional factions vie for control, users are increasingly doing as they please. The organization may suffer as incompatible systems proliferate and the "wheel" is reinvented again and again.

Developing Countries

A number of writers have discussed various aspects of the likely influence of technological innovations on library and information services in developing countries. Among the points stressed in a paper presented at a regional meeting of agricultural librarians in Brasilia[153] were the following: information can only be a valuable resource for development if potential users recognize it as such; developing countries should, as appropriate, create their own technology rather than rely on the direct transfer of unsuitable elements from industrialized countries; to avoid haphazard and ineffectual development, formal policies for information management adapted to national needs and resources are required.

With reference to the use of information technologies in Latin American countries, Cubillo in a paper for the 1986 IFLA Conference[154] finds that the very great potential is so far largely untapped. The most notable applications relate to the creation of bibliographic databases for retrieval purposes using mainframe or minicomputers. Recently substantial numbers of microcomputers have been introduced in libraries. These have tended to improve reader services, but the presence of computers has not yet stimulated wide creation of new information services or products. Prohibitive connection costs and royalties are restricting the use of commercial database services principally to industrial or commercial firms. He argues that "modern information technologies generated largely in industrialized countries should not be considered intrinsically EVIL for developing countries" and can be beneficial if their use is properly planned and managed. There is a widespread wish among librarians, fearing stagnation or even obsolescence, to embark on the use of technological innovations. But their capacity for action in most institutions tends to be limited. There is a growing demand for training. An urgent need exists for more training programmes in the management of information technologies and services. Longer delay in the widespread introduction of innovation increases the risk that the related decisions and policies will be made by other groups and without the influence of library and information professionals.

In another IFLA Conference paper Banjo[155] indicates at the conclusion of his review of efforts at computerization made in Nigerian libraries that the serious problems encountered so far have included insufficient funding but, most importantly, scarcity of manpower resources with a sufficient grasp of the conceptual, management and operational problems involved. While not much progress has yet been made the future of library and information services in Nigeria lies in adopting modern information technology. To move ahead there is need for a scheme of cooperation at national and international levels with a platform for collaboration such as a Committee on Library Automation to ensure economies of costs and efforts, establish standards and priorities and coordinate activities. Greater efforts in related education and training are needed and in this connection proposals to establish an African Regional Centre for Information Science (ARCIS) at the University of Ibadan are welcomed.

Arguing that science no longer knows geographic boundaries, Chateh[156] in his paper for the 1986 IFLA Conference urges the rapid introduction of new information technology in libraries of developing countries. Citing the example of the University of Yaounde (Cameroon), he suggests that the movement of university professors and students across continents in large numbers of exchange and study programmes and the scope of work undertaken in universities everywhere will require access for all scholars to the same tools wherever their work takes them. A rejection of this technology will lead to the isolation of an institution and the community it serves.

Park[157] reports in another IFLA paper that in the Republic of Korea a large number of research libraries have begun to make extensive use of information technology. University libraries and the National Library have also adopted new methods, in particular for cataloguing and serials control. The Research Library Group, Korea expects to introduce an online network by 1989 and expand it to include the university libraries by 1992. Other projects of the group are to develop a prototype computerized library and information system and to work with several ministries on realigning the national information network. Korean MARC will be further developed and its use extended. For Park, developing countries have no choice but to join the computerized library and information family. While some individuals object because of the domination of the advanced countries in the information field, the importance of providing the most modern information services to help resolve development problems is evident. Serious efforts are needed to ensure the sharing of information with the developed countries, under fair conditions. First priority should be given to automating cataloguing systems and database building in order to create the possibility for viable local and international information exchange.

Juhana Salim[158] in a study presented at the Tokyo IFLA Conference reviews computerization activities in Malaysia. All but one of the university libraries have automated their cataloguing systems. Special libraries have tended to give first priority to indexing and abstracting journal literature. A number of the libraries are extending these activities module by module and expect to develop integrated library systems. The provision of SDI (Selective Dissemination of Information) Services is expected to spread. Serious efforts will be made to improve links among the numerous database services located in various institutions. A national committee on computerized databases has been established to foster the work. The success of efforts to promote linkages into local and international networks will depend on telecommunication infrastructures and facilities.

For Lancaster,[159] in terms of providing users and potential users of information with what they need, many developing countries give insufficient attention to the collection, control, dissemination and preservation of their own literature, in particular that issued within government agencies, universities, research centres and experiment stations.

Concentration of the major sources of information within the developed world has undesirable consequences for developing countries. In addition to restrictions on import or on exchange of currency which can present a real barrier to acquisition, a level of dependence is created that is frequently resented. Language barriers are raised and a situation is created in which much of the literature which is best controlled and most accessible has limited relevance. International cooperative systems such as INIS and AGRIS reduce dependence, promote better control of literature generated within the developing countries and stimulate the establishment of information centres. Other valuable, internationally assisted work does go on. "Despite much rhetoric to the contrary, many of the developed nations have become much less altruistic vis-a-vis free or subsidized dissemination of information to their less developed neighbors. Much of this can be attributed to the rapid growth of the information industry... Information services have become 'big business' and control of information resources is passing increasingly out of the hands of the public sector and into those of the private sector... On the one hand, agencies of foreign aid are putting large resources into the developing countries, including resources to support information services... On the other hand... governments ... are yielding increasingly to pressure from the private sector. Much of this pressure relates... to protecting the commercial interests of the information industry."

Working Together

Attention is drawn by Sharrow[148] to some unsolved major issues which faced Canadian libraries anxious to participate in an automated resource network:

- Legal questions; copyright including that of audiovisual materials, publication on demand and full-text databases. Other ownership issues involve bibliographic and factual databases; videodisc.

- Jurisdictional and political concerns; participation of libraries supported at various levels of government (federal, provincial, local) make cost sharing and negotiations difficult.

- Funding issues; charging for services and cost sharing; libraries are usually funded to serve only their immediate clientele.

- Public versus private sector; what services should libraries provide? will these remain uneconomic? what services should libraries buy? should users pay? what can users buy directly without the intermediary of the library?

For Bucknall[150] "computers are great democratizers. Instead of the pre-war summitry of a handful of library educators or the somewhat distanced leadership of the great academic library directors... librarians at every level are talking together. Conversations generated because of the medium take place online, in user groups, in formal convocations and in casual encounters... Our bibliographic utilities have opened a dialog. We are interested in all manner of national and international standards to facilitate these dialogs, these interactions... This new access - the intellectual, interpersonal access to other librarians may well be the great legacy of computer networking to the library profession. As a dynamic it can effect far-reaching and as yet unanticipated consequences."

Gillman[147] points out that for librarians, knowing what information is required, by whom and for what purpose must be the primary concern. "Information is a valuable resource... A vivid awareness of its actual and potential usage in an integrated information service is therefore a natural expression of that value, and one which can lead to creative and productive exploitation. As individuals we are used to working alone and interacting with colleagues when necessary. We have only the most partial conception of what can be achieved through cooperation. But the cooperation must be directed towards a commonly understood goal; otherwise all the integration in the world will only lead to an ultimately greater confusion.

Abstracting and Indexing Services

Some observers have suggested that secondary bibliographic services will decline in importance once factual and numeric databases and full text of journals, patents etc. can be searched and the required information retrieved online. Dunn[160] maintains, though, that the broad subject coverage, resolution of language problems and deep systematic indexing of the services offer significant benefits to users and that many of them will therefore survive. They must, however, adapt as market needs and user preferences change.

In an article on the future of secondary services, Neufeld[161] identifies major forces which may influence the outcome. The continuing growth of primary literature should tend to encourage a parallel expansion of secondary or access products to assist in its control. The shift in use from printed to electronic services which is already apparent should continue. Further impact of new technologies on the production of services and products is to be expected. There will be a gradual reorientation of services in recognition of the fact that their users will increasingly be the end users. The future viability of secondary services will depend on their ability to respond creatively to the increasing overlapping found in the information transfer chain.

Jensen[162] has a very different view. "The time may not be far off when A&I publications will cease to exist." The increasingly numerous owners of microcomputers will soon reject the idea of conforming to standardized profiles. They will insist on receiving a selection based on an individually tailored profile, or better still, a tailored subset of one or more of the large databases on discs. Jensen suggests that while the organizations that contribute to this type of file tend to fear losing control and are concerned with proprietary rights, these problems will in time be solved. He feels that the distributive custom database is surely "the wave of the future".

In this connection Bearman[163] points out that several abstracting and indexing services have developed customized services and that many others are studying the possibility of building "packages" for their customers including specific subsets of databases, software, use manuals etc. Now that some secondary services have become retailers they are becoming the primary means of providing access into their databases. Similarly we are seeing publishers buy database producers, the merging of databases and publishers entering the business of creating databases. This blurring of traditional roles in the information transfer chain is very likely to expand the role of secondary services in providing more direct contact with their users.

The anticipated technological changes identified by Kennedy[164] include electronic publications on demand (which could have far-reaching impacts on the relative roles and relationships of primary, secondary and tertiary services and on user behavior and use patterns) and expanded networking to facilitate transfer. These should have a pronounced impact on services in the 1990s.

Keenan[165] indicates that in the production of services "there is a growing blur between bibliographic and subject descriptive information and hard, factual data, with hybrid databases emerging as the result." She predicts that the printed versions will continue to be needed "both for retrospective use and in those parts of the world not technologically sophisticated." Improved abstracts will be needed to cope with full-text searching in electronic form. Weil[166] agrees that it is premature to decide that full-text searching will eliminate the need for abstracts; in addition it is far from certain that the majority of information users will have access to full-text searching for many years. Some prophets, he adds, are assuming that eventually author-prepared abstracts from the original computerized documents will eliminate the need for abstracting services as such.

For Wigington,[167] though technological and economic factors will have some importance in shaping future abstracting and indexing services, the dominant factor will be sociological. Individual and group behavior will be the final determinant of what is used. It is likely that the future environment will rapidly turn to online, on-demand delivery of information. The changes in the way people acquire and use information will more drastically alter the way abstract and indexing services operate in the future than have the technological changes in the past altered the way we produce today's services.

In an article on bibliographic current awareness services, Rowley[168] assesses the future for these. Attention is focused on the range of services offered by various text retrieval packages in support of current awareness services. The electronic journal, electronic documents and document delivery services are identified as factors which might influence the nature of future current awareness services.

Document Delivery

Eres and Noerr[169] emphasize that to introduce online searching in a country does not in itself provide the world's literature. It frequently hardly begins to address the problem of accessing the country's own literature or that of other countries not well covered in the major abstracting and indexing publications. Realistic solutions that could be devised for the future depend on cooperation among institutions at the national level, or among a number of countries in regions where this is feasible. The "networking" approach enhances the chance of implementing a proposed solution. It tends to enforce a rigorous approach to the use and/or development of standards, certainly a critical area when dealing with access to external information sources and exchanges of information among countries.

The distribution of individual articles ("separates") takes place on a very large scale within scholarly and professional circles. Griffiths and King[170] analyze this distribution (in the form of interlibrary loans, reprints and photocopies obtained from authors and colleagues) in the science and technology and medical communities in the United States. It is suggested that the new technologies will speed up delivery and produce better copy quality at lower cost. As subscriber budgets become tighter, online searching identifies more articles, and organizations such as OCLC and Lockheed advertise access to separates, their use will further increase. Various options for establishing the document distribution/ delivery systems that will certainly be required are described.

Line[171] in a 1983 paper affirmed that technological development will stimulate a shift for libraries from a holdings to an access strategy and that texts will with increasing frequency be transmitted to users over long distances. Digital Optical Recording (DOR) seemed the most promising technique, but better quality printers would be necessary. This development would particularly affect journals. The most widely used and most prestigious journals would remain in printed form, but others would increasingly appear in electronic form only. There will be a trend to supplying individual articles, possibly directly from publishers. Pricing and control are likely to be critical problems as is the balance between information brokers and public sector intermediaries.

Russon[172] reports a growing interest in publishing and storing documents in electronic form. It is expected that the arrival of optical discs will have a strong impact on this. He suggests that as is proving true with bibliographic database hosts, economic factors will probably determine that only a few document hosts can be sustained. The challenge will be to ensure that the resulting services meet user needs. The problem cannot be tackled by libraries alone; publishers and other information providers in the public and private sectors must be involved. Issues that will need to be faced are: the respective roles of institutions in the public and private sectors; questions regarding copyright; the archival question (to support retrospective use); procedures for bibliographic control; the impact of these developments on traditional publishing; and the examination from the standpoint of usefulness and accessibility of the structure of the traditional journal article and the fostering of desirable revisions in this format.

The thorny problem of copyright in relation to future document delivery services is studied by Bull.[173] The inherent dilemma is to balance author protection against free access. It seems desirable that the necessary legal reform in the United Kingdom be based on establishing general analogies between information in printed and machine-readable forms, rather than having it applied to specific mechanisms. The United Kingdom will need to take account of the concepts of moral right and public good in the matter in other legal systems.

Rowley[168] suggests that the possibility of immediate retrieval could make current awareness services more attractive to many users. The suppliers who are in a position to couple online SDI (Selective Dissemination of Information) services with online document ordering and delivery are likely to predominate in the marketplace - provided their price is right. The speed with which change will come is difficult to predict, and is likely to be faster for some fields than for others.

In a paper prepared for the 10th On Line Meeting in London (December 1986) Stern[174] describes the ADONIS project which will deliver the content of some 300 biomedical journals on weekly CD-ROM discs to selected "document fulfillment centres". The trial, planned for early 1987 will last for two and a half years. An ADONIS Consortium of commercial publishers was set up to jointly fund the research project which will lead ultimately to a commercial service. The original partners were Blackwell Scientific Publications, Elsevier Science Publishers, Pergamon Press and Springer-Verlag. It is expected that the experience will contribute to establishing new relationships between publishers and libraries, particularly with regard to the development of user friendly services, improvements in the economics of such services, copyright and payment of copying fees. The British Library, the Centre de Documentation Scientifique et Technologique, Paris, the Medical Library in Cologne and the Royal Academy of Science in Amsterdam have agreed to take part in the experiment which has also received a grant from the Commission of European Communities (CEC).

An African view of document delivery problems in the science and technology environment is presented by Hunter in an IFLA paper.[175] She suggests that the success of any library programme in Africa ultimately depends on the ability of the librarian to speedily satisfy needs of existing and potential clients for information. In the science and technology area the primary information sources are serials, government or institutional documents and conference proceedings. Maintaining good collections of serials or providing photocopies from them is impossible without adequate funds and foreign exchange. Attempts to share resources nationally and intra-regionally are impeded by financial constraints, infrastructural inadequacies and lack of manpower. Until African countries can improve their economies, thereby removing some of the constraints to document delivery, more assistance needs to come from industrialized countries to support these efforts. Specific suggestions are made. It is noted that in 1983 only sixteen periodical titles from Africa were among the 2,709 indexed for Index

Medicus. Consequently a considerable amount of relevant information remains inaccessible to African health personnel in the absence of regional or national indexes. A scenario for a reasonable document delivery service for 1996 is given, based on the assumption that the national economies will have improved and that telecommunication and telephone services will have been extended.

Problems of document delivery in science and technology in Asian countries are outlined by Daxun He[176] in another IFLA paper. Attention is drawn to the fact that only 31 titles or 10% of Chinese biomedical periodical literature was selectively indexed in the Index Medicus (1983). For Southeast Asian periodicals in the field the figure is 15%. Fortunately India produces an index to Indian medical periodicals and is planning a database modelled on the MEDLARS system. China as well as Indonesia and the Philippines have taken similar steps and Southeast Asian nations have set up a database called PERIND at the South-East Asian Medical Information Center.

Social Aspects of Information Work

It is the view of Diener[177] that within each country and within each ideological bloc conflicting visions of the nature of information are held by members of different spheres in society. In the political sphere, information is viewed as a source of power through control exercised over its processing. In the economic sphere information is viewed as a resource, either an asset for lease or a commodity for sale. In the social sphere information is viewed as a social good to be freely shared by all. In the cultural sphere information is considered a cultural resource, the basis of belief and social reality. One of the challenges to the emerging information society is the need to develop the expertise to understand modern society and its informational phenomena. Unfortunately, research is more often focused on the technologies than on the sociological environments in which information-related events are occuring.

Drake[178] maintains that information technology is effecting changes on corporate structures, culture and behavior. In her view people-oriented cultures are required as a framework in which to ease problems of adaptation and reduce frustrations. It is impossible to deny the current importance in some societies of corporate cultures and it is important to understand the relationship between information and corporate cultures.

It is proposed by Lenk[179] that additional research is required on the social control of new information technology. Insufficient attention has been paid to problems of centralization of information which affect the social organization of power - and to the effects of information technology on everyday life. He attempts to define the role of research in the political control of information technology. As only limited improvements to the information basis for technical policy decisions are possible, an effort must be made to find ways of keeping future prospects open and of ensuring that effective mechanisms for correction and political control are maintained.

Certain of the present and on-going socio-economic effects of information technology are identified by Cronin.[180] These include:

- amplification; technology allows us to store and access more information and send it more quickly than in the past. The availability of electronic databases linked by telecommunications networks and gateways will increasingly marginalize traditional print-based repositories;

- globalization; the growth of packet-switched networks and satellite communications reduce the importance of national boundaries. This increases market opportunity and competitiveness but creates many problems relating to ownership and control and the flow of data across national borders;

- acceleration; instant access to information is influencing the conduct of affairs by reducing the time required for decision making and policy formulation;

- concentration; progressively, control and ownership of information is (through mergers, purchases etc.) being vested in a relatively small number of resource-rich organizations. There is an oft-cited fear that in the absence of explicit regulation, a two-tier information society may emerge;

- decentralization; electronic access, distributed processing, etc. encourage a counter trend to that of concentration and foster local control and individualized work patterns;

- mystification; the majority of the population remains informationally and technologically "illiterate" since the rate of change surpasses the rate of absorption at the grass-roots level. This may be overcome in time, but will require more energetic orientation and retraining efforts;

- transformation; while it does eliminate some jobs, technology clearly also creates new jobs and opportunities. Governments are faced, however, with the challenge of finding alternative work, educational or leisure opportunities to absorb the structural unemployment which threatens to become a permanent feature of modern societies;

- intensification; a heightened information awareness is being created, especially in business and government. There is already some shift in attention from the hardware to the content of information systems and the uses to which information can be put. Some form of government information policy or legislative framework is needed everywhere to ensure that the rights of access by all are protected;

- commercialization; traditionally information was treated as an overhead expense. This has been changed by the introduction of computer based information retrieval systems and the development of value-added services and networks. An extremely volatile and competitive marketplace has been created. Public sector information utilities could be pushed aside. "It would be in the interests of the population at large if public sector agencies involved in the information-supply business were to enter into partnership with commercial organizations in order to bring on stream new services and products to improve their revenue base. In a fully-fledged information society, great care and attention will need to be given to demarcating the lines between the public and private sectors [to avoid] worsening the quality and range of services available to the less advantaged sections of society."

Some of the same views are expressed by Page[181] who identifies trends likely to be apparent in applications to come in the near future. Among these are a new commercialism, the tendency to regard the information product as a material good, large product units rather than small, and the protection of local information industries rather than internationalism. Electronic publishing and document delivery are the next likely major applications of new technology. Libraries are the traditional focus for professional information seeking and for document supply. Electronic document delivery, whether as an adjunct to or substitute for interlibrary lending could, like online searching, constitute a natural development of information supply services to library users.

Finally, for Line[182] information technology will have both good and bad effects on human lives and society. It will change the concept of information: recorded knowledge will be more fluid and changeable and the boundaries of the library's role will be less clear. There may be serious competition between private and public information sectors. If all information is to be treated as an economic commodity, this could result in the unavailability of many scholarly and scientific papers. Disturbance of the present balance between public and private information sectors could have serious consequences for both. Other effects could be an increased gap in provision for rich and poor, a need to restructure recorded information for online viewing, the danger of deliberate corruption or destruction of knowledge held in electronic stores, and a reduced individual capacity to absorb knowledge. Line objects to the view of many writers "that because something can be done it will be done and should be done - a sort of technological imperative... By all means let us consider what technology can do, but let us consider also what we want to be done, whether technology can help us do it and what other consequences might follow from the application of technology... Librarians should be neither enthusiastic and uncritical supporters of all applications of IT, nor should they be passive and helpless observers: they should become involved and seek to influence events."

Information Communication

In the future, the librarian's role will center on communication and not on the identification and location of material, Sligo[183] predicts. The consequences of adaptation to a communication orientation will include reduction in size of library units; increased subject-specialization and a greater need for a knowledge of clients' subject areas. He suggests that libraries model themselves on the lines of information brokers and feels the librarians who successfully communicate can influence decision making and transform the profession.

The acquisition of information to support technological transfer is of keen concern to many librarians in developing countries. Writing on this theme Acosta Hoyos[184] stresses that the process must be carefully controlled to avoid economic and cultural dependency stemming from the acquisition of advanced technology from the industrialized countries. Use of traditional transfer mechanisms, such as patents and licences is decreasing, while the role of multinational companies, who tend to use technological transfer to dominate third world economies is increasing. He encourages developing countries to use instead such channels as invisible colleges and research publications for specialized information exchange. For Freire[185] the transfer of technological knowledge is a process involving social and cultural communication between the information producer and the consumer which can lead to transformation of social structures and relationships. The ideology of the dominant capitalist technology producers tends to replace traditional techniques and culture, leading to a homogenization which reinforces dependency, particularly in rural areas. The extension worker as a mediator between information producers and consumers and an agent of social change has the responsibility to oversee the modernization of local economic systems without the obliteration of popular culture.

In a text emphasizing the legal and political aspects of Transborder Data Flow (TDF) prepared for a 1986 Unesco regional seminar on information policy held in Colombo, Sri Lanka, Sebestyén[186] explains that if during the 1970s network architecture tended to be highly centralized around mainframe computers, during the 1980s the gap between the "center" of a TDF system and the periphery is in the process of disappearing as a result of increasingly broad access to microcomputers. He identifies the following as among problems connected with technology transfer: the most advanced circuits, computers and telecommunication systems are the domain of a very few countries; while it may be less expensive for receiving countries to purchase reliable existing technologies, this does not stimulate the use of endogenous skills; the importation of technology can create certain dependencies and increase vulnerability.

While the main functions of TDF networks in the 1980s remain file transfer, message sending and transactions like ordering or banking, a new element is the emergence of public telematic services such as teletex, videotex, facsimile (telefax) and message handling systems. In the past TDF involved the electronic transfer of data through borders. But with the trend to distributed processing, the use of personal computers and the development of optical mass storage systems, the classical TDF transport media are extended. In future TDF applications it can be expected that the WORM (Write Once Read Mostly) optical disc will play an important role in office and mass storage environments whereas CD-ROM (Read Only Memory laser Compact Disc) will become an important distribution medium for bibliographic as well as factual databases. In the future CD-ROM - based microcomputers will replace to a substantial extent remote online access to centralized major database hosts. Legal aspects of TDF touch personal data (now the subject of Data Protection/Privacy legislation in many countries); freedom of information; legal protection for data and computer programs. Security aspects include those of access security (passwords, etc.); data security (use of codes and controlled access); data integrity (needs for authentification, non alteration of data, etc.). Political aspects include export/import control, dependency issues, national security, etc.

In a paper on TDF in the context of international services prepared for the same Unesco seminar Sauvant[187] notes that in the countries of the European Community the decrease of employment in manufacturing of four million jobs between 1973 and 1981 was more than offset by an increase of six million jobs in the services sector. The "goods bias" in current thinking "makes it difficult to perceive the real nature of our economy and to anticipate future changes in it... Like generals who blindly prepare for the last war, our economic policy-makers spend too much of their time thinking about the last economy." Although most services are intangible and nonstorable, and although as a rule their production and consumption occur at the same time and in the same place, international transactions in services are now reaching a large scale. Among these transactions an important place is being occupied by data services.

Data resources are made up of data goods (hardware); data services (data processing, software; information storage and retrieval, databases); the research required for their development (R & D); and the capacities and skills needed for their production and application. In economic terms the balance of importance is shifting from data goods (hardware) to data services. Data services can be delivered to foreign markets in the form of foreign direct investments (establishment of affiliates to produce and sell services) or trade (transmissions by telecommunication and computer technology). There is widespread international debate on the desirability and the modalities of extending the international trade regime which is applied to goods (as embodied in GATT, the General Agreement on Tariffs and Trade) to services. These negotiations seem likely to occur in GATT though use of this forum is opposed by the developing countries as a group and some others who would prefer UNCTAD (The United Nations Conference on Trade and Development) as a forum.

While up to the present the developed countries have been the principal targets of the online information market, Ennison[188] points out in a 1984 article that the developing countries have gradually become aware of TDF issues and are taking an active interest in them. As a group they are much concerned with nonpersonal data and the state's sovereignty over its economic resources. Brazil has developed a TDF policy aimed at regulating international data communication systems. African countries have affirmed their commitment to the principles of free flow of information.

Gurnsey[189] maintains that one of the causes of the worsening information gap between rich and poor nations is that many learned societies in the West are now being run with financial rather than professional priorities. They have cancelled exchange agreements for their primary products and are developing secondary services in such a way as to make them inaccessible to the Third World countries which lack the necessary computer equipment. There is need, Ribeiro Ferin Cunha[190] insists, for a new world information order which would operate outside the information network of the developed countries with information geared to their particular needs and expressing their particular views. The first step towards information independence is for the countries concerned to establish national information policies, and cooperate in planning integrated information systems to counterbalance the unrestricted flow of information from the industrialized countries. Surprenant and Zande[191] draw attention to the conflicts which the transition to the electronic information age is creating between the developed and developing nations. Three issues that may inhibit information flow are radio frequency allocation, the New World Information Order and Transborder Data Flow. Librarians should try to help resolve these problems that threaten effective information handling and utilization. Tell[192] deals with related problems as he points out the need for a new formulation of a general approach to the information transfer problem in the developing countries and the use of the new technology.

Briquet de Lemos[193] fears that for developing countries over-reliance on the resources of the developed countries can only result in dependency and the erosion of national identity. He regrets the tendency to acquire inappropriate and expensive technology while ignoring the information available in the Third World itself. In this situation the information professional must avoid easy reliance on imported information and instead promote cooperative systems maximizing the use of existing resources.

Using statistics from Canadian and USA journal publishers Woolston[194] shows that a commercial market for information services produced in developed countries barely exists in developing countries. He suggests that this is because the information of interest to developed countries has little relevance in the Third World. In contrast Third World information might broaden cultural perspectives for industrialized countries. There are models of equitable work-sharing in information that deliver products that all can afford but still stimulate entrepreneurship. He illustrates this with reference to AGRIS - the system managed by the Food and Agricultural Organization (FAO) to cover agricultural sciences and technologies.

It is suggested by Moura Leitão[195] that technological development results from a learning process based on the acquisition of information. This process is impeded when there are obstacles to the free flow of information. In the developing countries, for example, information is initially derived from industrialized countries in what amounts to coded form, as "know-how" rather than "know-why". Genuine technological advance is only achieved and communication established through decoding and reapplying the basic principles in new local contexts. This produces accessible information which can be passed on and easily absorbed. Technological autonomy is dependent on removing these barriers to the free circulation of information.

Technical Processes and Services

The future direction of technical services in libraries is forecasted by Grarns[196] who, with particular reference to the situation in the United States, suggests that recent rapid progress in automation of these services may be slowed by increased costs. He anticipates the interconnection of major bibliographic utilities, access to Library of Congress authority files online, wide use of automated serials control and of online library catalogues as well as the adoption of a common inquiry language. While publication formats may change, the book will remain a principal information element.

Suggesting that libraries will receive increased use where they will function as information evaluation and referral agencies, Willar[197] predicts that libraries will compete successfully with vendors offering commercial information products. Libraries will adapt service functions and organizational structure to provide services demanding of their professional staff a greater arsenal of skills and more perceived expertise than at present. A large proportion of technical service functions will be absorbed by bibliographic processing centres outside the library. Many present technical service librarians will move into public service ranks, become systems analyst consultants, work in bibliographic record centres or accept administrative tasks.

The future of technical services, in Thompson's view,[198] will be determined by that of publishing. Change is apt to come more slowly than some imagine for economic reasons. Economics will necessitate a general revision over a period of time of the underlying assumptions of technical services, and this will have a profound effect on the place they occupy in the library. Clasquin[199] considers the evolution of relationships between the library and the periodical subscription agency against the background of adoption of new technology, the probable growth of electronic publication and the electronic delivery of literature. Change must be viewed as a natural process and as the one constant element in the relationship between libraries and subscription agents. Attention is drawn by Piternick[200] to extensive future changes in interlibrary loan borrowing as a result of widespread use of online searching and electronic messaging in Canadian university and public libraries. Even more drastic changes would obviously occur should a widely-used electronic-based document delivery system develop.

Having examined predictions that computerization will do away with cataloguing and the attitude that cataloguing is irrelevant because users do not consult the catalogues, Rowley[201] notes attempts in the United Kingdom at cooperative cataloguing and changes in cataloguing function, particularly as part of an integrated stock control and management information system. He predicts that cataloguing will remain a relevant discipline for librarians because the cataloguer is the creator of a specialized bibliographic database. This provides a firm foundation from which to develop a true understanding of other branches of information retrieval.

Pointing out that the development of MARC and the establishment of networks like OCLC have created possibilities for improving cataloguing practices and decreasing work input, Manning[202] suggests that the catalogue of the future will offer multiple access to collections, in-depth analysis of content and easy updating. These will constitute a new range of services which will significantly increase the potential use of library collections.

In a paper prepared for the 1986 IFLA General Conference in Tokyo, Marco[203] describes his view of the desirable characteristics of subject bibliographies in the twenty-first century. Since completeness cannot literally be maintained, purposeful selectivity should be the goal. The provision of correct access terminology for highly technical subjects must be assigned to advanced specialists in those subjects. Citations on any subject should be arranged in a qualitative manner for the user. Each entry should be accompanied by a serious abstract. Value judgements prepared by experts should be provided for each item listed.

Holley[204] suggests that many of the changes introduced into subject headings and classification numbers by the bibliographic agencies of the developed countries to accomodate computer use hinder subject access in those developing regions which frequently lack new technology. For the traditional card catalogue-based subject access system, use of material prepared for computer-based institutions may lead to more frequent changes in headings, less pre-coordinated structure and the assignment of more terms per document. In the developing countries, classification, since it more easily crosses linguistic boundaries, may become the preferred means of subject access.

It must be recognized, Anderson[205] feels, that information technology and sophisticated catalogue design are not going to be possible or practical for a long time in many libraries in both the developed and developing worlds. Bibliographical services that will support manual systems must be continued. These include printed national bibliographies and card services. While the British Library had already noted (1983) that its card service had dropped from an annual distribution of 5,000,000 to 750,000, it recognizes that this is a service required in both smaller libraries and overseas libraries.

In designing and developing computer formats for bibliographic services, national bibliographic agencies will keep in mind the practical possibilities of international exchange and develop formats that will be hospitable to international rather than national practices. To support the future growth of information exchange there is a need for more internationally acceptable transliteration schemes and the development of character sets for many more Asian scripts. "We cannot... envisage a future where the roman script dominates the data bases and on-line systems. We should be able to postulate a future where the national bibliographical agencies... produce current national bibliographies... with records of their national publications appearing in [many] scripts, and with those records available in machine-readable form or as printed issues of the national bibliographies or as catalogue cards, all the product of the computer."

Online Information Retrieval

Writing in 1983, Killen[206] recognizing a generally developing view of information as a commodity, forecasted for online systems an increasingly heavy use without the intervention of librarians or other mediators. The royalty factor in searching costs was likely to increase disproportionately to the fall in costs of telecommunication and hardware.

In 1985 Summit and Meadow[207] noted as major trends for the online industry in the USA: more source data, greater subject variety and more retrospective data added to the files; telecommunication was to remain inexpensive and grow in speed and reliability; user languages would become more complex and powerful but easier to use; users would become more proficient, more demanding and more diverse; the overall cost of online services would decrease or perhaps remain constant.

Drawing attention to the impact on libraries of online developments, Lewis[208] suggested in 1984 that libraries will continue to have a repository function for those materials which they currently hold as print on paper. Their future role in relation to electronic media is less clear. If an increasing amount of publication is to be available in electronic form only, its archiving is unlikely to be a library responsibility, unless libraries develop the technological capability to retain and refresh electronically-restored text. Alternatively, libraries may find themselves obliged to store printouts with consequent difficulties in shelving and reproduction. In an electronic world the concept of volumes, issues and even pages becomes irrelevant, so the means of reference to electronic materials need to be standardized in advance.

In a society in which much information is delivered directly to the user, a library role may initially be hard to see. But the future of electronic publishing is not clear. The concept of an electronic novel, or monograph, or of electronic leisure reading generally, is less credible than that of electronic journals, so we may guess there will still be print on paper for libraries to store and issue. Journal articles may gradually transfer to electronic means of publication, but the reader will still need to be alerted to the publication of relevant material and be assisted in the search for older material. There will be a long period in which old and new methods will coexist and the user will need extensive help.

The medium term future may be marked by competition between publishers, host organizations and libraries in determining who is to supply current materials to the user, and who will service his abiding needs for retrospective search and personalized information delivery. The future for the library and information community lies in its acceptance of a wider role than that which it has traditionally filled. It is unlikely that many more bibliographic databases will be created, but numerical ones, on the other hand, will increase in number, as will full text and textual-numeric bases. "The Information Manager, fully aware of what is passing over the systems, aware of who needs and uses what part of the information flow, able to locate and bring into productive use previously untapped sources of information... is what the librarian and the information officer of today will become if they are to survive into tomorrow."

Ownership of databases, Lewis points out, appears as a problem principally in the form of the copyright issue. There are questions about ownership in a copyright sense of bases created by collective activity, and of the extent to which any one partner has rights over the whole. But more important questions relate to what the user is entitled to do with a database, or, in effect, what it is he buys when he registers as a user and makes access. Is the user paying for a single act of service when he accesses a database, or is he purchasing the right to use a relevant piece in any way he chooses, including downloading and local manipulation but excluding resale? Growth of electronic publishing will make the issue more acute.

Production of databases has been dominated by the United States with a relatively small contribution from Europe, and to a large extent, in spite of the contribution made by Euronet Diane, access to the databases is also in the hands of the U.S. Europe is handicapped by the size of the market and dependent on export earnings for the viability of its databases. The need to operate in several languages does not improve market prospects. "The European Commission, in supporting database development... gives preference to multilingual bases, recognising that to be viable a European database must be marketable in Europe as a whole and if possible throughout the world. National services created and supported with heavy national subsidies have not succeeded in becoming viable, and it is now clear that the only way in which a healthy European information industry may be developed is on a European basis."

Writing from the standpoint of the private sector in the United States, Kilgour[209] examines the effect of public policies on national and international computerized networks. He discusses public policies related to national networks in the USA and other countries and describes the effects that public policies impose on activities of international networks. He analyses the intent of these public policies and evaluates the current status of public policy and law in regard to computerized information processing.

For Bortnick,[102] "Traditionally the United States has led in the number of databases produced and most nations were dependent upon information provided by them. The European Community responded to this by establishing in 1979 the Euronet Diane system to provide European customers with sources of information originating in Europe which could be accessed through the public data networks of the member nations... The Europeans view these developments as indicators of their success in providing online services to their community without relying on American sources. This move to develop a European-based market has drawn criticism, however, from those who support a more open environment." In his discussion of this topic Page[181] comments, "While to some, European policy in respect to EURONET and EURONET DIANE (the network of host services) is seen to be a protectionist reaction against the successful US penetration of the domestic European market, the contrary interpretation is also possible, if one views the actions of the European PTTs in removing legal (and possibly economic) impediments to the flow of database interrogation traffic from Europe to the USA."

An article in the Library Journal[210] on the consequences of database sharing describes the goal of sharing stored information across political boundaries. The difficulties involved in the achievement of library cooperation include the environment in which transactions between librarians and vendors take place; keeping library law in step with technology; and the lack of compatibility between automated systems. In the future librarians must be diligent in their pursuit of standards, tough in the market place and should work toward a system that will store and communicate bibliographic data at low cost.

Videotex

Videotex links the television set and telephone with the computer. Yeates[211] explains that in doing so it has at once found favor with those who feel able immediately to get to grips with the "user-friendly" medium and scorn from those who feel it is too unsophisticated for serious use in libraries. For Yeates "the potential for videotex in libraries and information services lies neither in instant ease of application, nor in simple replacement of existing technologies, but rather in the facilitation of new activities, of new ways of meeting the same needs that users have always had, and of meeting newer needs resulting from social change. Videotex is established in 26 countries. It offers simple access to computerized information at low cost, and easy system management. It can be enhanced to provide full interactive access to existing computerized databases. It can work in systems displaying video/films, broadcast teletext services and live television. It can be used with cable and satellite television systems to provide active services like teleshopping, telebanking and the transmission of computer programmes. Advances in hardware will result from the new videotex standard to be used throughout Europe - the CEPT standard. Videotex software will increasingly be built into other database software so that occasional and unskilled users can share access to large files or transaction processing systems or electronic messaging systems.

Over 120 public libraries in the United Kingdom provide a Prestel terminal for public use, usually with staff acting as intermediaries. It is the most widely-available new technology in British libraries (1984), used by 58% of library authorities, compared with online information retrieval (54%), teletext (45%), microcomputers (43%) and electronic mail (7%). Elsewhere the experience in libraries is more limited. It is used to some extent in the Federal Republic of Germany. In France, however, libraries have tended to avoid the Minitels which are established, though, in 1,000,000 homes and being increasingly used to provide information. The community files developed in British libraries have not all been of professional quality, but are generally improving. The Information Retrieval Service of the European Space Agency (ESA-IRS) and other services have developed videotex interfaces to help occasional users of their systems. It can now be used alongside a sophisticated library package. This gives users a fully interactive data system.

It is shown by Harris[212] that videotex activities are increasing rapidly, worldwide. While the main concentration is in Europe, other countries active in the field include Brazil, Ecuador, Hong Kong, Indonesia, Kuwait, Malaysia and New Zealand. The national systems in Europe have been interlinked since 1985. Trends show that Videotex, this simple and cheap technology, is becoming increasingly compatible with a variety of information technologies.

Numerical Databases

A considerable evolution is expected in the compilation, handling and use of numerical databases. Kuhlman and Lee[213] report that most research libraries have tended to leave to computer centres the task of dealing with huge data stores such as those made available on magnetic tape by the US Bureau of the Census and the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan. Research libraries have traditionally regarded the data sets compiled by researchers as the personal possessions of individuals and tended to ignore their cataloguing. The arrival of microcomputers is responsible for the start of a transformation that the small bulk, low cost and large storage capacity of CD-ROM is expected to continue. As devices for reading printed materials and transforming them into machine-readable form improve, retrospective publishing of statistical and other data on compact discs or similar devices can be expected. It is thought that many libraries may purchase, catalogue, store and make available complete discs or partial copies. Librarians will have to acquire new numerical skills and undertake new and more detailed cataloguing. This will represent an enhanced role for librarians. US Census officials, journalists and librarians expected to meet in December 1986 to examine modalities for use of CD-ROM or similar devices for issuing the 1990 census documents.

In an article on providing online access to scientific data

Green[214] explains that such services are still scarce in the United States. It is not, however, too early for data experts and the scientific community to join forces in taking stock of the existing raw materials for online services. To delay decisions can increase the possibility for the duplication of effort and for the proliferation of standards.

Thomasson[215] describes the future role of librarians as intermediaries in search services drawing on nonbibliographic databanks. The intermediaries of today will become the teachers and trainers of future users. Some end users will always require assistance in restructuring and processing the information in the form they require. The likely evolution of numerical databanks in developing countries is described by Lorenz and Rose.[216] Downloading into distributed systems (as contrasted with remote online access) will flourish; increased networking among databanks and local networking to users will occur; databases will increasingly include evaluated data; the computerization of data collections and data handling will increase rapidly.

The problem of "downloading" is examined by Mortensen[217] in a 1984 article. This is a method for capturing information sent to a computer by another computer, as opposed to letting it disappear as it rolls off the screen. It is also an alternative to online printing of information. In data processing, data storage and retrieval are often accomplished by downloading to an external computer or onto disc storage devices. In online searching, downloading provides means for transferring information from a time sharing system into microcomputer memory. The process is regarded as a threat by producers and vendors of online databases. There is fear that major portions of a database might be "pirated" for repacking and reselling. The increasing storage capacity of microcomputers is adding to the apprehension. Large-scale use of downloading to avoid online charges might be self-defeating since were important loss of income to occur, database producers would have to revise prices for online charges.

Finally with regard to improvements in the transfer of data to developing countries by telecommunications, Puccioni[218] describes recommendations issued by the International Telegraph and Telephone Consultative Committee (CC ITT) for the establishment of inter-continental transit centres reachable by radio-telephone links or satellite operations in developing countries; for data transmission, and for packet switching techniques. International packet switching gateways have been established in the main telecommunications centres of the world. The inter-continental teleinformation service is already able to offer access for developing countries to over 600 databases in Europe, the USA, Canada and Japan.

Related Areas

There are three areas outside the library and information field to which numerous references have already been made, but which seem also to require brief separate treatment. Predictions about the future evolution of computer and telecommunication technology, about trends in publishing and about anticipated developments in storage media have occupied a conspicuous place in the recent professional literature of librarianship because they are so widely viewed as likely to have a profound effect on the information world of the future.

Computer and Telecommunications Technology

We are reminded by Gleave *et al.*[131] that "looking at the technologies at the developmental end there is scope for more radical changes in information handling practices in the not too distant future. Speech synthesis and artificial intelligence are techniques that have the potential to revolutionize current practices. Whilst speech as an output from a computerized system is fairly well established, using speech as an input is more error prone. There are rapid advances. Techniques for spelling detection and correction are improving. But the use of A I (artificial intelligence) and the improvement of expert systems must lead to the major changes of the future."

The listing of a considerable number of technologies, still in a developmental stage, which many writers predict will be applied to information handling is drawn from Raitt.[10]

Input technologies

Optical character recognition (OCR). Widely used in banks.

New developments allow direct conversion of text into digital form, thus speeding up later manipulation (or printing).

Voice processing

New products becoming available which allow adding voice commentaries to memos, etc. before filing or transmitting them. Voice processing elements include speech recognition, voice synthesis, and store and forward voice switching.

Touch terminals

Faster than keying (as for typewriters) and more accurate. (One selects or inputs by touching items on the terminal screen which appear as lists (menus), symbols, or graphic images).

Storage technologies

Video/optical disks

Video discs provide high storage capacity. The data is non-erasable, though erasable ones are being developed.

Optical digital disks place digital information on the disk directly in very high density.

CD-ROM has several advantages over the video disc technique. It is less expensive, less bulky, requires less equipment and is virtually standardized.

Holography

Holograms are essentially light waves. It is said that with this technique the whole of the Library of Congress could be compressed to the size of a sugar cube. There is a potential of great access speed. Progress is held up by materials technology problems. Constraints are that a coherent light is required as well as a darkened viewing area and laser light sources; the images are monochromatic and cannot be enlarged or reduced; the process can only image static objects.

Processing technologies

Robotics

Mechanical devices programmed to perform tasks under automatic control. They are said to be able to solve problems, reach conclusions and learn from mistakes. Few library applications have yet been attempted.

Expert Systems

"Automated consultants" which interact with the user to solve problems. They show promise for user training purposes and for searching online data bases.

Information Retrieval

Spatial Data Management System (SDMS) under development at Massachusetts Institute of Technology since 1976. Related experiments under way at Rank Xerox, Toshiba, etc.

Output technologies

Voice processing

Flat panel displays

Transmission technologies

ISDN (Integrated Services Data Network). Being tested at national level in Japan.

Lan (Local area network). For use in institutions, on campuses, within administrations, etc. Library applications are being worked on in Sweden, at Aslib (UK), at the National Library of Medicine (USA) and elsewhere.

Satellites. Apollo (Article Procurement with On-Line Local Ordering). The Commission of European Communities, the European Space Agency and Eutelsat are exploring digital delivery of documents using high speed satellite links to small dish earth terminals.

Storage technologies

Videodiscs - Being used at National Library of Medicine for orientation and guidance of visitors.

Digital optical disk - The Library of Congress is using this for its highspeed on-demand laser printing of catalogue cards (two million orders per year). Also experimenting with a preservation programme using high density optical storage of page images.

Gilman,[146] writing in 1984, predicted very substantial development of hardware for information handling. He listed first "the much-vaunted Japanese drive for the Fifth Generation - machines which embody a degree of intelligence, albeit of a highly artificial nature". He looked forward too, to parallel processing, "machines which will not only run several programs at once ... but carry out a multitude of steps in the same program" at the same time. In the area of storing and transmitting, innovations will be optical, using lasers to read and write optical disks, and optical fibre cables for transmission.

Writing in 1983 on a market perspective for electronic publishing, Gurnsey[219] defines this very broadly as encompassing all information distributed electronically. He distinguishes four main categories:

- broadcast non-interactive, i.e. cable television, teletext;

- interactive services, i.e. viewdata, online;

- stand alone electronic products, i.e. personal computer software, video tapes, discs, etc.;

- other, i.e. the electronic journal, document delivery systems.

With regard to the market, for any new development to be successful there must exist a "readiness potential" (availability of suitable technology and an apparent market) and an "enabling infrastructure" (the service infrastructure and reliability).

Online took off very rapidly based on the secondary journal market - and subsidized by it. Full text services, numerical databases and data compilations will add complexity to this whole market area. The success of Teletext in the United Kingdom took many by surprise. It was made attractive by ease of use, low cost and the absence of hidden costs. In 1983 it was largely devoted to general interest information and there were technical constraints to the expansion of the service. Cable television has had little impact in Europe, but it could yet prove a major competitor to telephone-based systems in the home information market. As for the electronic journal, this involves the writing, editing, refereeing and distribution of a scientific article with no paper intermediary. In marketing terms most of the "push" seems to come from those involved with the technology. Little interest is expressed in the marketplace and, so far, little serious attempt has been made to determine what market, if any exists.

For Gurnsey,[219] as a profession we respond poorly to the changes in technology that surround us. As a result products are "thrust upon us which do not meet our needs or extend our professional capabilities. Bibliographic online merely happened. If the same is not to happen in the general electronic publishing area there is a need for the major institutions to forget their internecine squabbles and get together to give a corporate response...".

Cronin[31] identifies expert systems as "one technology which could... have a major impact on library activities in the longer term... Possible applications could conceivably include cataloguing, classification, library guidance, user education, referral, reader services and book stock/use analysis. We are still a long way from the point where the reference librarian will be replaced by an expert system (or, more likely, a battery of expert systems), but the possibility warrants serious attention". The one area in which what may loosely be termed expert systems are being utilized is online searching. "A number of 'front ends' have been developed which enable naive users to search (untutored and unaided) online databases. Systems such as Paperchase are truely user-friendly, and in effect make the trained intermediary redundant. It would, however, be unwise to assume automatically that the library of the future will consist solely of a sanitised battery of 'intelligent' machines."

For Salim Agha[220] "Expert systems as offshoots of research on Artificial Intelligence (AI) are exciting and offer hope to our undervalued profession. It is the profession that must quickly take steps to get involved in the process of establishing and effectively utilising expert systems".

Publishing

The impact of new technology on the publication chain is analyzed by Oakeshott[221] in a British National Bibliography Research Fund Report. Major changes are noted in long distance, non-physical access to information, in multi-media formats and storage and in the partial use of and multiplication from a single physical product. The further developments which are technically possible will depend on a number of economic, practical, human and political factors not necessarily under the control of the parties concerned. With much still in the experimental stages, the future pattern is unclear and may prove to be less well-defined than in the traditional publishing chain.

Gibbons[222] suggests that information personnel regard electronic publishing as a description of a means of delivery. Publishers and printers emphasize the use of computers in organizing information in a form in which it can be easily manipulated for both printed and electronic delivery. He maintains that information products need to be designed independently of their ultimate form of delivery. This possibility for repackaging information in a number of ways offers hope for the future evolution of the publishing industry. Pointing out that the technological changes occuring in publishing today are normal evolutionary trends of adapting and using appropriate tools to effectively produce information products and services, Kaunitz[223] suggests that the technology of artificial intelligence fits this pattern. The technology of knowledge-based publishing will be the most important innovation to be adopted by publishers since computerization of the information publishing process.

In relation to the likely effect of microchip technology on the future demand for printed literature, Somninskii[224] predicts that books and magazines will probably always exist side by side with information stored and disseminated electronically, just as the theatre did not die with the appearance of the cinema. Brownrig and Lynch[225] provide a perspective on electronic publishing by distinguishing between "Newtonian" publishing and "quantum-mechanical" publishing. This distinction revolves around the means by which information is distributed. Much of what is currently called electronic publishing is actually classical Gutenberg-style publishing carried out by modern methods. But there are also new types of publishable artifacts that computers and recent advances in telecommunications have generated. With reference to copyright law issues, they explore the distinction between the replication and the display of a copyrightable work.

Insisting on the likelihood of continuing innovation in publishing, Lancaster[71] writes, "Clearly the printed book is not threatened by the types of publication now available in electronic form. How could it be, for most of the electronic products are merely printed books displayed electronically. An electronic encyclopedia could and should be much more than printed pages viewed on a terminal. The same must be said for the science journal. True electronic publication implies that authors would compose for a different medium and, in so doing, would no longer be constrained by the static limitations of the printed page.

When the true capabilities of electronics are employed to convey information or inspiration, we can expect that completely new communication forms will emerge. Such capabilities would include the use of sound, moving pictures, and electronic analog modeling... The printed book will be replaced by something quite different from anything we have yet seen, and this will occur because the medium replacing it will be widely perceived to be better."

Copyright

The thorny question of copyright is raised frequently in this literature. "New technologies", Avram explains,[75] "...have created great difficulties in the application of traditional principles of copyright... New technologies and media threaten to cause irrevocable loss of control over copyrighted works because of the easy replicability of information. The locus of potential copyright violation is gradually moving from the publishing house, library and photocopy centre to the home, where the individual consumer may be asked to consider copyright issues and refrain from taking advantage of new technology in ways that violate the legitimate rights of authors. In addition, the concepts 'intellectual work' and 'fair use' themselves have become muddied."

The introduction of modern technology in the information environment, Riggs[226] shows, brings more complexities to the copyright law as it applies to accessing scholarly information. Legal interpretations are sought on how the computer, videodisc, satellite broadcasting, non-bibliographic databases, television, audio and video recordings and laser holography all fit into the "what can or cannot be reproduced syndrome." The technology - copyright issues will only become more confused as the rate of technological change intensifies. Courts in the United States "are currently recognizing 'fair use' as a pivotal factor in many of the technology - copyright cases... Whenever prophets claim that the traditional library of today will radically change as a result of electronic publishing, one cannot help to wonder if publishers and other copyright owners of creative works will ever permit such a revolution in our delivery of scholarly information. Without question, the profit motive has been a significant cornerstone in the entire copyright matter... What is wrong with our current copyright system is that copyright owners and libraries have not been able to reach a common ground... These differences of opinion seriously impact the basic rights of the proprietor and the rights of the user of scholarly information... It is time for all of us to recognize that copyright cannot deny access to information."

The threats posed to copyright by technical innovations in communication are discussed by Ladd in two articles[227,228] in which he explores how copyright can be adapted to two major challenges of the 1980s: the new technology enabling broad-based dissemination and simultaneous reception by huge audiences of large quantities of creative works and the development of the doctrine that the consumer should have the widest possible access to all copyright material at the lowest possible cost. Ladd calls for copyright laws framed in broad terms so as to comprehend later unanticipated uses and a campaign to convince the public that copyright is an instrument of freedom and not a restriction on their rights, for it ensures a continuing diversity of creative works.

For Molholt[229] "one of the single biggest issues that information handlers have struggled with in the last ten years is that of protection of copyright. Our current environment, with its proliferation of photocopy machines and personal computers, offers perfect opportunities for easy and... inexpensive ways to copy information. We can do little except make the public aware of the laws and hope they are followed. Software manufacturers, on the other hand, are studying ways to prevent unauthorized copying, ranging from physical deterrents to program obstacles. As we move farther toward the information support system, where less and less is acquired except by the process of access to centralised files, the issue of copyright will become much easier to deal with since use will be tracked within the system... New information access techniques will break traditional bibliographic units down into fragments better suited to user needs. The information we retrieve from the system will not often fit the current boundaries: a journal article, a book chapter, a patent. Furthermore, information will be linked in such ways that traditional distinctions will be blurred - especially when artificial intelligence is involved. I now fear that creators of information, ourselves included, will once again scramble to find new ways of receiving fair payment for work done without excluding users by high price barriers. Given the place of information-handling in our economy, developing a workable pricing system for intellectual property is of central importance."

Currents and Countercurrents

In a paper presented at a meeting of the International Publishers Association, Bradley[230] asserts that the new technology is hitting conventional publishing on three fronts: reference publishing, educational materials and the storage and retrieval of learned and research information. He draws attention to the issue of the shift of responsibility for information provision from private to public hands. He maintains that users, given the facility to select precisely the information they need will have to become accustomed to paying for that information and for the availability of the information they do not use. There is a need for cooperation between publishers to meet high costs. The fact that publishers are devoted to competitive selling and librarians to the free circulation of information represents a difficulty in the control of technological developments. In the course of discussing potential benefits and problems for authors, publishers and librarians brought on by electronic publishing, Garson and Howard[231] cover the issues of ownership and storage of information as well as the quality control of publications. It is expected that libraries will undergo considerable change as a result and scientists seem likely to be the principal beneficiaries.

Tomajo and Drake[232] report on the ways in which technologies are affecting the way scientists and technologists communicate. The developing technologies covered include electronic bibliographic data retrieval, personalized information systems, electronic mail, text editing, teleconferencing, electronic publishing, telefacsimile and optical and laser disc storage - all from the standpoint of future scholarly communication. In a discussion of the probable forms of the electronic book, Goodman and Dalrymple[233] envisage both text stored on floppy or optical discs and read via a screen and one-off printing on paper on demand via a laser printer in the home or office..

BLEND, the four-year Birmingham and Loughborough Electronic Network Development project funded by the British Library Research and Development Department is described by Oakeshott.[234] The aims were to assess the cost, efficiency and impact of an electronic communication system and to explore and evaluate alternative forms of use communication through an electronic journal and information network. It has resulted in the creation of a community of experienced users.

Scepticism about the imminent arrival of large scale paperless publication of scientific journals is expressed by Wattenburg[235] in a paper prepared for the IFLA Conference in Tokyo. The formulas, graphics and photographs, often in color, which figure prominently in these publications are not yet easy to successfully transmit by electronic means and this will contribute to what may be general resistance by users. Electronically distributed journals seem likely to remain a supplementary rather than a replacement publication form. Yet electronically published information will be widely used as a source for copies, especially if the distribution can be connected with the publishing process, as for example by CD-ROM or via full text databases on host computers.

Rowley[168] points out that the electronic journal, however it develops, serves as a reminder that, especially with the widening availability of computerized databases, it is possible to link a current awareness service much more closely with the original documents and information it announces, than is the case in many bibliographic current awareness services today. A series of successful electronic journals would also herald the acceptance of online current awareness in electronic form. Currently, many users still prefer printed notifications, but their preferences may be eroded.

It is the opinion of Craig[236] that evolution rather than revolution characterizes the view of the publishing community on electronic publishing. Decisions to publish electronically will be business decisions based on customer needs, available format alternatives, the business climate and other factors. The technology exists to create virtually any electronic product but publishers are influenced in particular by customers' reactions to new products and by the likely effect on their own role as intermediaries in the dissemination of information to the end user.

Bucknall maintains[150] that the "full text databases produced to date have been designed to test the market. Essentially they are to determine whether the desire for instantaneous viewing or overnight transmission of journal articles, for example, coincides with willingness to pay for the cost of the service. Journals which have elected to publish exclusively online or dually online and on paper also are a part of this enlarging textual electronic databank... The adaptability of online publishing for a full range of information purposes is not yet proven. In the future, electronic publishing could also be distributed offline by means of optical or possibly video disks. In the same vein, currently online data files could be distributed as disks to libraries or the end user. Some of us have been thinking of the library of the future as a paperless electronic switching center. But perhaps it will still collect material objects to which physical access will still be demanded, only computer disks will have been substituted for books. More likely it could be a combination of the two, that is a switching center, plus a collection of physical objects... which can be directed to the end user at remote locations, through cable television or other media."

Downs[237] inquires "... what realistically are the issues to be faced in an expansion of electronic publishing which at the same time meets the needs of scholars and librarians in the academic marketplace? Who are the principal stakeholders...? Can librarians contribute to this evolution, and help to shape it to the interests of scholars and researchers? To begin with it should be understood that much information is already available in electronic form as a by-product of the printing process. The lack of industry-wide standards has been a crucial obstacle to the creation and competitive pricing of new information products based on this store of electronic data." The Association of American Publishers and the Council on Library Resources have been working on a standard to replace the multitude of internal codes on which personal computers, word processors, electronic typewriters and mainframe computers operate. If adopted, the manuscripts keyboarded by all authors can be in standard form and the publishers can economically process input and design and market alternative information products.

A joint statement [238] by ten European publishers and librarians issued after meetings in Amsterdam in May 1984 may contain elements which can lead to a resolution of conflicting views. It concludes: "If full advantage is to be taken of the benefits which can be conferred upon learning and commerce by the new information systems, a reasonable and understanding dialogue must be maintained between publishers and librarians. We therefore urge that discussions should be continued both at national and international level, and that the two professions regard themselves as complementary in these new enterprises."

Storage Media

At the outset of his article on optical discs, Nugent[239] remarks that in terms of the benefits they offer, they seem to have been designed specifically for libraries. While optical storage is still an emerging high technology and one of the fastest moving technologies in terms of new developments, new company formations, and new product offerings, optical disc systems of high capability are available today which can be the basis for significant improvements in library operations and services. Today the optical disc industry is still in its infancy, but it is an industry with explosive growth potential...." A dominant characteristic of optical discs is their extremely high density of information storage (some 50 - 200 times greater than the high density magnetic discs currently used in major computer centres). High density is an important benefit by itself, and leads to important reductions in both retrieval times and costs. Optical discs can very significantly reduce the space needed for growth in library collections. Because they are designed for access under computer control and because all readout is done with a reflected beam of light from a low power laser, there can be swift and precise computer access to any record in a vast store without deterioration under conditions of constant usage. Like any computer retrieval system, an optical disc system can serve many user terminals simultaneously from files that are always fully intact and ready for use. It is felt that the combination of newer optical recording materials with longer life expectancies along with automated programs of error testing and rewrite will make optical storage a desirable preservation medium. The earliest applications of optical discs in libraries were for the retrieval of text, page images and pictures, and in the playback of digitized music.

New developments in optical storage seem likely to expand the scope of these applications. Already on the market is the Compact Disc Read Only Memory or CD ROM. When used as a data source for microcomputers these will provide the microcomputer user with the capability to access massive databases without paying communications costs or service bureaus. Libraries will acquire CD ROMs and will find many reference uses for them. Write-Once optical disc drives and discs, low cost microcomputer peripherals which permit building local databases at low cost, have also been introduced. Erasable optical discs were introduced during 1986. The first high definition television (HDTV) videodiscs were introduced late in 1985. These will expand the applications for videodisc access to visual materials in libraries.

Miyaoka[240] in his paper on optical disc technology for the 1986 IFLA Conference is also enthusiastic about the potential for library use. The "read-only" discs (such as videodisc and compact audiodiscs) may be successors to "trade books" and text books and figure prominently in future library collections. While not yet standardized, the "write once and read many" optical discs will be widely used to provide compact storage and easy retrieval. The erasable discs will also be useful for information for which a short useful life is foreseen. He suggests that the library as a repository of books may eventually fade away as an electronic publishing industry notifies potential readers daily about its latest offerings and authors are compensated through an elaborate copyright system when readers call material on their home screens.

The experimental work done by the Library of Congress on the use of optical discs has been widely reported in the literature. In launching its Optical Disk Pilot Program in 1982, Price[241] reports, the Library of Congress attempted to go beyond the limitations of microform and magnetic storage as archival preservation forms by verifying the suitability of optical discs from the standpoint of physical stability, environmental tolerance, transference (copying) of stored information without general loss and predictable longevity. Print materials have been stored on digital optical disc. Non print or image-based materials are stored on analog optical discs, commonly called videodiscs. In a more recent paper prepared for the 1986 IFLA Conference, Price[242] emphasized that the programme aims to evaluate the use of optical disc technology not only for information preservation but also for information management. It was expected that the pilot project would be finished at the end of 1986 and the results carefully studied in succeeding months. Related questions of copyright and royalties will be examined by an advisory group which may put forward guidelines. The findings are eagerly awaited.

The fact that information technology until recently tended to favor alphanumerics as the medium of communication is mentioned by Purcell and Okun.[243] Formerly the emphasis on text militated against those application areas in which the visual image was a crucial factor. This has changed with the new pattern of linking computer databases with optical videodiscs. As a consequence, design, architecture, and both the fine and graphic arts have become state of the art application topics in the area of large-scale storage and retrieval technology.

One project employing videodisc technology which has attracted considerable attention is Project Emperor - I described by Chen and Stueart[244] in a paper prepared for the 1986 IFLA Conference. The project, supported mainly by the Humanities Project in Libraries, US National Endowment for the Humanities, applies videodisc technology in presenting and interpreting the site and the artifacts of the tomb of the First Emperor of China. The first product is two double-sided 12 inch videodiscs, each containing visual images and audio tracks. A related comprehensive database composed of detailed information on the artifacts is being constructed for interactive and simultaneous use with the videodiscs on a micro-based system such as Digital Equipment Corporation's Interactive Video Information System (IVIS). Coursewares are being designed for various levels of users.

While Barker[245] reports (1986) that "currently available CD ROM systems are unable to simultaneously accomodate text, audio and visual information, manufacturers are discussing producing a specification for interactive audio and video applications of CD ROM (called CD-I). This would include speech; static and animated images; computer graphics, files and programmes as well as audio and video - and make of CD ROM a truly interactive multimedia facility." Barker cites as among the reasons why information held in electronic form is more useful than that in conventional media: ease of simultaneous sharing, enhanced access control, ease of transmission and manipulability. Work stations will increasingly be prepared to cater for the reproduction or dissemination of pictures, text and sound, perhaps in particular through use of the videodisc.

Miller[246] points out that CD-ROM technology has matured to the point at which a commercial CD-ROM publishing industry is feasible. "As major buyers and users of information, libraries will be among the first to feel the impact - and the confusion. At present (1986) in the USA complete systems can be bought either from product vendors or from systems vendors. Most systems are "closed" de facto because of the absence of standards to provide compatibility across hardware, operating systems, search software and files. Standards are being developed and should be settled (for the USA) in 1987.

Libraries are prospective customers for two classes of CD-ROM publications - those for their organizational and professional activities and those purchased for users. Information providers may decide to regulate access and it is not yet known to what extent there will be access or transactional fees for users. Optical media of various types are in a state of rapid development. They will not generally replace magnetic media but will augment and complement them. CD-ROM as a technology has benefited greatly from the success of the compact music disc and from its good "fit" with microcomputers. The remaining problems in CD-ROM publishing are: how best to update files; how to organize and fund sales and customer support; pricing strategies; intellectual property right (copyright). The requirements are analogous to those encountered when microcomputers and online public access catalogues were introduced.

In his paper on the impact of optical disc publishing prepared for the 1986 IFLA Conference, Bartenbach[247] finds that "there is strong evidence that the information industry is gravitating towards CD-ROM as the preferred medium for most applications. There is a strong feeling that CD-ROM has definite advantages with regard to standards and in economies of scale in the production of disc players and discs. The lack of standards for videodiscs and the higher costs of players and discs are seen as major drawbacks for videodisc systems... Other optical media are in various stages of development, such as OROM (Optical read only memory), WORM (Write-once-read-many), DRAW(Direct read-after write), laser cards, as well as erasable media. In the Spring of 1986, Philips and Sony announced a new type of compact disc, called CD-I (Compact Disc Interactive). CD-I is not a peripheral to a microcomputer, but a self-contained system that will store multimedia information, incorporating graphics, video, sound and text. CD-I has been designed for the mass consumer market as a multi-media extension of the audio compact disc. However the mass-produced CD-ROM appears to be the most appropriate and promising format for optical disc publishing."

At the end of an evaluation of the medium's characteristics, Bartenbach concludes, "Librarians will carefully weigh the advantages of CD-ROM against their concerns regarding the new technology. Will local control, privacy, unlimited access and psychological advantages outweigh the lack of currency, lack of completeness, and lack of security? Publishers will also carefully weigh lower production costs and control over distribution against their concern over migration, pricing and the market size. Optical disc publishers will have to confront the challenge of working with a new technology that differs substantially from traditional publishing with regard to hardware and software, type of marketing and customer support. CD-ROM offers market opportunities for new information products... Publishers will have the opportunity to be innovative in the way they deliver information. Librarians and library patrons will benefit from innovative new information products. A hybrid system combining the advantages of optical discs and those of online distribution suggests itself as a solution to the needs of librarians, publishers and online vendors."

REFLECTION AND COMMENT

Introduction

From the preceding review of the literature it is possible to identify trends which seem to have rather general application internationally and can be thought to forecast the character of libraries in tomorrow's society.

In expressing their divergent views on various aspects of the future of library and information services the authors cited have exhibited a perhaps surprising consensus in their prediction that the application of new and emerging information and telecommunication technologies will significantly influence the future of the profession, the library as an institution and the services offered. Most of the 250 authors of more than 35 nationalities seem to share this view. It appears to be held as firmly by information professionals in Africa, the Arab States, Asia and Latin America as by those in Europe and North America. Dangers and disadvantages there may be for the profession and for society, but change related to the application of new technologies will continue its course or be introduced everywhere. At least it may be said that those who hold a contrary view seem not to write articles forecasting a future for libraries anywhere in which the traditional methods and approaches are likely to be long maintained.

In addition readers will have noted the emergence of recurring themes including the following:

- the advent of the "information society";
- the changing information environment surrounding libraries;
- the increasing value assigned to information access;
- libraries in competition with commercial providers of information;
- the costs of providing access to information;
- sources of funding for services offered;
- managing the transition to new roles for the library;
- new roles for library managers, staffs and users.

Overall, the review points to the increasing value placed on information by contemporary society and raises questions of how libraries will meet the demands for access and how the costs of access will be borne.

The following pages reflect and comment on the material presented under the principal headings of the literature survey.

The Future Information Society

The future information society towards which all societies, though at different paces, are moving is arising through advances in science and technology, particularly in the areas of computer and telecommunication technologies. The socio-economic impact of these changes is already great as post-industrial societies begin to emerge - societies in which a new importance is assigned to information. We are assisting at an information explosion and this information has to be organized. Modern society is becoming increasingly complex and more and more dependent on information. Theoretical knowledge plays an increasingly important role in social life.

While information technology is inert - neither a panacea nor an evil - it is a catalyst of economic, political, social and cultural processes that affect the development of society. Thinkers agree that there is need for much institutional and social innovation if the enormous potential for betterment of the human condition offered by modern technology is to be realized for all.

The Future for Librarians - The Profession

Librarians everywhere must create changes for libraries that parallel the changing needs for information in society. A much greater involvement than in the past with both the producers and the users of information has become imperative.

Some have seen technology as an unstoppable driving force in the face of which the profession must try to preserve itself through a series of adaptations to the technology, but without questioning the purposes of the changes and innovations. Others correctly recognize that there is a social purpose for the innovations and see a need to plan and control the introduction of technology and advocate for the profession the role of leader of events rather than that of follower.

"As new technology continues to lighten the burden of routine handling of books as physical objects, librarians must turn their attention to the communication of contents... This requires not the neglect of traditional media but their extension by means of the new. Libraries must not neglect their role as repositories... but become also mediators and promoters of communication..."[18]

It is important to use the opportunity offered by the penetration of new technologies for redefining what librarians do and how librarians should serve their users. Librarians must understand and contribute to policy issues relating to information. The profession seems likely to become much more "issue conscious" and to work more actively than in the past with members of related professions.

The Future for Libraries - The Institutions

It has been noted in many parts of the world that users of library services have a rapidly increasing awareness of both the importance of information and of the scope which now exists for meeting individual information needs. Satisfying those users will require the adoption by many libraries of a new perspective within which the needs to be met must be studied and the means to satisfy these needs identified and progressively put in place. The traditional hierarchical structure of libraries does not always accomodate itself easily to the incorporation of modern information technologies. The latter tend to be built around a different model where networks rather than hierarchies predominate and this will significantly influence the structure and interrelationships of libraries.

National Libraries

In order to prepare for providing effective service in the new information environment national libraries are examining questions like the need for establishing shared national collecting networks rather than centralized stores, shared cataloguing strategy, the revision of legislation to incorporate materials in new formats and substantial expansion of conservation and preservation activity.

Public Libraries

Identifying the most appropriate roles for future public library services is a preoccupying question in many countries. A serious examination of the information needs of the communities they serve is being undertaken even in countries where this has not earlier been the practice. The effort to maintain existing levels of services while striving to introduce new services and facilities which the evolving information environment demands causes problems. There appears to be a tendency to increased emphasis on the reference function and on service to specialist groups. The widespread current development of information and advice services, in particular those characterized as "community information services" seems likely to intensify and become a major preoccupation of future public libraries. In many countries a heavier emphasis on actively supporting programmes of continuing education, self-directed learning and distance-learning can be foreseen.

The anticipated wide use of personal computers in offices and homes will inevitably affect the overall service strategies and organizational patterns of public libraries. The move to an "access" strategy rather than a "holdings" strategy and intensified dependence on networking and resource sharing to fill user demands seems certain to intensify and will further modify the character of public libraries.

At first in the countries where information services are the most highly developed and later more generally the public library will have an important role to play in ensuring that the needs of those who cannot afford to purchase home computers or terminals and those who have not yet developed the skills to use these technologies are safeguarded. Public access channels and mechanisms will be required for the less well-off sections of the community. The issue of payment for access to information in the public library framework will be the subject of continuing debate and discussion.

Academic and Research Libraries

As for academic and research libraries, in most countries these are at present under considerable financial restraint because of the prevailing economic situation which seems unlikely to change quickly. Consequently important and fundamental investment in the conversion of data concerning their holdings into digital form will be slower than many prognosticators would have us believe. In spite of the revolutionary nature of the newly available technology it is probable that the determining factor in the speed of its adoption generally will be the economic realities rather than the willingness or otherwise of users to adapt.

Data on current awareness of new work will move into the new technology scene long before the retrospective conversion of existing resources. The role of the academic library, therefore, in continuing to provide traditional resources is assured. The maintenance of that activity will provide a continuing role as research information procurement centre.

Academic libraries will continue to administer expensive and limited resources. Their experience and traditional impartiality will continue to make them more amenable than computer centres in supporting user needs. Initially academic libraries will become "cluster" centres with hard copy and terminals for the shared use of traditional and new information data resources. The library's role as switching centre and its back-up resource of hard copy will ensure it maintaining an ongoing position for the foreseeable future.

Teaching and research patterns will continue to move towards the breaking of new ground by bringing together via computer applications data from a wide variety of media, reusing traditional resources and interrelating and superimposing computerized analysis techniques. Academic libraries have had as the basic justification for their existence the support of teaching and research and they will necessarily follow the patterns of the clientele that they serve. As teaching and research patterns continue to change, library and information services will follow rather than being replaced; their experience in controlling and organizing data is already demonstrating the weakness of technical staff in this area.

A move from "holdings" to "access" policies which the new technology supports will encourage academic libraries to become more selective about what they hold and increase their interdependency.

School Libraries

The changing information environment seems to many likely to encourage a shift in the main focus of school libraries to the development in children of information skills. Society is reaching a stage where everyone in order to work and live effectively will need to look for, evaluate and use information properly. The importance of incorporating the mastery of these skills in primary and secondary education is increasingly recognized and the school library / media centre seems in most countries potentially the most suitable setting for this undertaking.

The related changes in educational trends in which a move away from traditional dependence on rote learning to an accent on developing learning skills is very notable and seems likely to foster substantial school library development in the future.

Special Libraries

The growing trends in the special library sector to distributed processing, decentralization and direct end-user access to information suggest that the substantial changes in organization and services already begun in this sector will continue. Special librarians seem even more likely than others to play increasing roles as intermediaries. The trend in special libraries for a greater focus on the information needs of managers and administrators seems certain to intensify and continue.

Organization and Administration of Libraries

While the debate over the advantages of centralized versus decentralized national library and information systems continues, the rapid development of microcomputers and possibilities for distributed systems seems to many to decide the issue in favor of decentralized systems employing national and international standards to ensure compatibility.

Technological innovations will continue to influence strongly the organization and administration of library services. Over a period of time much of the work of acquisition, processing, location of books and journals as well as circulation routines will be computerized. The cost of maintenance of books and journals will rise, in part because of paper preservation problems. Remaining library activities will be highly service-oriented. Online access will become general in libraries. Library networking will spread. Electronic publishing and document delivery are widely seen as the next likely major applications of new technology. The increasing interdependence of libraries may well have as one result diminishing local autonomy.

It becomes an important responsibility for library management to design future roles for the institution, plan accordingly and make the adjustments required in staff and services. Already notable in the most developed countries is the blurring of different elements in the information transfer chain from which new roles for information professionals including librarians emerge. These shifts may impose structural changes in libraries.

The growing interest in the use of marketing methods by libraries in many parts of the world to study the information needs of users and prospective users and to develop services in a problem-solving framework is likely to intensify. The introduction of information technology and the growth of a commercial information sector have very much complicated the issue of charging for library services. Traditional viewpoints on this question in the national, academic and public library sectors are being reexamined in many countries.

Many governments are establishing national policies to promote their information industries and to protect against the potential negative effects of the Information Age. Privacy protection, questions of national and cultural sovereignty and economic development are some of the national concerns that influence efforts to arrive at acceptable international information policy formulation. Efforts to achieve agreement require a flexible approach which both promotes unrestricted dataflows and accomodates national concerns and priorities.

Problems relating to copyright will continue to be a major issue in libraries. Some of the factors are the increased availability and diminishing cost of copying facilities, corporate action by publishers in some countries, new technological developments such as optical scanning, image storage and telefacsimile, the international transfer of machine-readable bibliographic records and concern about the extent to which copyright ownership may act as a constraint to access and international data flow.

The Application of New Technologies in Developing Countries

In the developing countries some progress has been made in compiling bibliographic databases for retrieval purposes, but the presence of computers has not yet stimulated wide creation of new information services or products. In a number of Asian countries the numerous computer applications in libraries have focussed on cataloguing and serials control, but online services are also being introduced. In many developing countries it is felt that first priority should be given to automating cataloguing systems and database building in order to create the possibility for viable local and international information exchange.

Obstacles in some developing countries to the adoption of new technology have included the scarcity of suitably trained professional staff; inherent resistance to new technology on the part of some information professionals; the special climatic conditions of heat, humidity and dust present in some countries; lack of stable power supplies; the proliferation of incompatible equipment; scarcity of appropriate software; currency problems; and the scarcity of maintenance services. Some of these obstacles are being overcome in connection with the proliferating and now widespread use of computers in these countries in universities and research centres, government administrations, business and financial establishments, industry etc. An environment in which computerized information services are demanded is being created.

The trend towards reduction of cost and increase in the power, reliability and flexibility of computer equipment seems to ensure its increasing use in the libraries of developing countries. Microcomputers seem destined to contribute importantly to the organization of locally produced information and the optimal use and sharing of existing resources. Creation of local databases will develop local capabilities and stimulate creation of software adapted to local needs and local languages. Dependence on foreign information sources will be reduced. New digital storage devices including CD ROM may in time significantly facilitate access in developing countries to periodical literature and help overcome the difficulties encountered with inadequate and expensive telecommunications links.

Library and Information Work

It is widely expected that the continued penetration of new technologies into the information industry and publishing will result in substantial increases in direct end-user access to information; a greater volume of electronic as opposed to print information; and improved capacity for rapidly acquiring the texts of documents instead of just citations to these. Such advances will have an impact on library work. At the same time traditional library materials will remain important far into the future as necessary information sources and will receive wide use in libraries for study and research and for pleasure.

Librarians should play a more active role in the shaping of future equipment for information handling. In the past the design of some computer-assisted operations may have concentrated too much on simply carrying out more rapidly and accurately tasks previously performed by manual methods. The special knowledge of information handling techniques, information needs and information use patterns which librarians have acquired should be fully drawn on in order that the full potentialities of new technologies can be exploited.

A lessening role for technical service staffs is forecast at all but centralized processing organizations. The importance of "secondary" access to information through indexes and abstracts may ultimately diminish as emerging technology ensuring direct access to the document is adopted.

There will be more emphasis on subject specialization and better management skills. Progressively the public image of the librarian will shift to that of a skilled consultant evaluating and advising on the use of traditional and electronic information sources. Librarians will less frequently than at present be identified by a place (the library) or in association with a particular medium (i.e. the book). Rather they will be thought of in terms of their service activity for people. The librarian will increasingly be a gatekeeper who controls the flow of communication and a guide.

Unesco and IFLA and the Future of Libraries

IFLA regards active library associations as important catalysts for the future development of library and information services. They provide forums for serious planning and concerted action. Associations working collectively as in IFLA can contribute importantly to the establishment of international consensus on evolving issues of concern to the profession.

IFLA is stressing throughout the period of its Medium-Term Programme, 1986-1991 three complex issues - conservation, copyright and information technology. Repeated reference is made to all of these in the literature review. IFLA, of course, does not undertake its work alone, but seeks to associate its efforts with those of other international organizations, both governmental and non-governmental.

The most conspicuous focus for the contribution that IFLA is making to shaping the Library in Tomorrow's Society is its Core Programmes, important areas of professional concern to which the Federation is devoting particular attention over a long period. It is to be noted that these programmes are interrelated and interacting.

The importance ascribed by IFLA to the concept that information and access to information are foundations on which tomorrow's society is to be built is demonstrated by Universal Availability of Publications (UAP) which rests on the principles that access to information is essential for the development of nations and of individuals and that the present systems for providing information are inadequate. The objective is the widest possible availability of publications (recorded knowledge issued for public use) to potential users wherever and whenever they are needed. The programme seeks to identify constraints on availability and to propose, encourage and support action to improve the present situation at all levels and at all stages. UAP is relevant to all those involved in the production, storage, dissemination, conservation and use of publications. It is the user who is the ultimate beneficiary. The papers, meetings, research and other activities undertaken promote the establishment of suitable national policy frameworks and the undertaking of positive practical measures for improved access.

The effective use of modern technology requires the establishment of national standards based on the application of international standards and recommendations. Standards will become increasingly important as the move to connect systems grows. Even in anticipation of future mechanization it is necessary to apply them in areas like cataloguing to allow easy conversion of the records in due course. Standards are ultimately required to make differing technologies invisible to the user. IFLA's *Universal Bibliographic Control / International MARC* programme (UBCIM) promotes the production of a single bibliographic record for each publication and the exchange and use of compatible bibliographic records. UBC is achieved by the standardization of bibliographic descriptions and the choice and form of access points in bibliographic records. The records established in one bibliographic agency must be interchangeable with those of other national bibliographic agencies, whether the records are available in machine-readable or other more traditional form. The International MARC aspect of the programme promotes the exchange of the imprints of each country in machine-readable form, eliminating the need for duplication of conversion of bibliographic data, and ensuring machine-readable records which follow internationally accepted standards.

Almost all forecasters agree that libraries will retain far into the future an important responsibility for safeguarding the accumulated published records of mankind - records which are threatened to an alarming extent by the rapid disintegration of the wood-based paper on which so much has been printed since the middle of the nineteenth century. The *Preservation and Conservation* programme (PAC) promotes the search for solutions to the serious problems of physical deterioration of library and information materials thus helping to preserve and conserve publications of the past, present and future. It helps to ensure permanent access to knowledge published in all formats. In addition to the preservation and restoration of materials in their original formats there is concern with promoting methods of preservation in other formats and the application of modern reprography and information technology for this purpose. As far as future publications are concerned the programme promotes among information producers, manufacturers etc. the use of acid free paper and durable binding and the development of materials which will not decay under difficult climatic conditions and during short periods of time to be used as supports for published information (tapes, films, discs etc.).

Various aspects of the international flow of data including the protection of privacy of individuals, threats to national sovereignty, tariff barriers and technology transfer have become subjects of concern among governments, international organizations, library and information services and multinational corporations. IFLA's Universal Dataflow and Telecommunications programme is designed to promote the electronic transfer of data among libraries internationally and strives to ensure that the vital interest of the library community in resource sharing and access for the individual user is preserved. It is important that the views of the library community be accomodated to as great an extent as possible as solutions to international dataflow problems are devised.

While the goals of library work are constant wherever the profession is practiced and the methods used to meet these goals are the same everywhere in their main thrusts there are at present in many developing countries special problems to be faced in acquiring library skills; in dealing with local information environments where the reading habit may not be strongly implanted or where the prevailing languages are those in which few library materials exist; in overcoming the obstacles posed by poor transport, communications and telecommunications infrastructures; the presence of widely scattered rural populations; difficulties in obtaining foreign currency and many others. IFLA's Advancement of Librarianship in the Third World programme (ALP) which promotes the improvement of librarianship in developing countries concentrates on the creation of the best possible conditions for development of library services through the efforts generated in the developing countries themselves. Stimulating horizontal cooperation among librarians in the developing countries is the main aim of this core programme.

Since its creation in 1946 Unesco has always actively promoted library development in cooperation with a constantly growing number of Member States, intergovernmental organizations, professional associations and leaders in the field. Through research, publications, the organization of meetings and the conduct of operational activities Unesco has stimulated thinking and action on key questions and problems arising in the information environment.

In order to provide a focus for the Organization's activities in the fields of specialized information systems, libraries, documentation and archives, in 1976 Unesco established the Division of the General Information Programme (PGI). PGI is responsible for the implementation of most of Unesco's Major Programme VII: Information Systems and Access to Knowledge, one of the fourteen areas into which Unesco's entire programme is divided. This has as its objectives to: (a) facilitate the access of Member States to information and to promote its unimpeded flow; (b) support Member States' development programmes in this area; and (c) enhance Member States' capacity to exchange, store, process and use information. Major Programme VII incorporates the principle that developing countries should be encouraged to increase their self-reliance and to develop technical cooperation among themselves.

PGI promotes the creation and development of libraries, archives and information services as well as that of units responsible for referral, analysis, consolidation and repackaging of information, data compilation and other functions contributing to the flow of information from the source to the user. A high priority is affixed to activities aimed at establishing regional networks.

Unesco/PGI encourages the application of information technology in developing countries. Such applications include use of computers, especially microcomputers, in library and information work, setting up local databases and online access to remote databases, using national and international telecommunications networks. It should be noted that a balance is achieved between innovative pursuits that take technological changes into account and the continuing efforts made to establish and reinforce essential traditional information services (national, academic, public and school libraries) which will remain basic means of acquiring knowledge and safeguarding the intellectual heritage of all nations.

In the area of education and training PGI fosters the establishment or reinforcement of regional and national training institutions. It organizes intensive courses for participants from developing countries with a view to updating the knowledge of teachers of library science, managers of systems and services and archivists. PGI also prepares and disseminates teaching packages, textbooks and curricula and prepares model user training materials. It conducts activities designed to improve harmonization of training programmes in the various branches of the information field, and collects and disseminates information on training opportunities and materials.

In addition to the activities included in its planned programme PGI is charged with executing many operational projects, national and regional, in the developing countries which are supported by extrabudgetary funds, in particular those of the United Nations Development Fund.

In the undertaking of this multifaceted programme working relations are maintained with those international governmental organizations, in particular organizations of the United Nations, which carry out information activities and are able to contribute to the implementation of the programme. Cooperation with a considerable number of international nongovernmental organizations including the International Federation for Information and Documentation (FID), the International Council on Archives (ICA) and the International Federation of Library Associations and Institutions (IFLA) is maintained through consultation, joint studies and contracts and by subventions in appropriate cases. In the area of librarianship special reference might be made to active collaboration with IFLA in the programmes for Universal Bibliographic Control (UBC) and Universal Availability of Publications (UAP) and on conservation problems.

Unesco's principal long-term goal in the field of libraries and information is to facilitate general access to information, to promote its free flow and to expand Member States' capacities to exchange, store and use the information needed for their development. International effort in the creation of worthy libraries for tomorrow's society will support national efforts to offer the best possible service to information users of every type, everywhere and to enable these countries to participate fully in regional and international information systems.

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